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Refusal to Supply

AN authorised undertaking is required, under penalty, to give a supply to any premises within fifty yards of its mains, provided the wiring and apparatus conform to reasonable requirements of safety and are not likely to interfere with the supply to other consumers or to cause appreciable leakage of current.

Compliance with the I.E.E. Regulations for the Electrical Equipment of Buildings meets the requirements of the Electricity Commissioners for securing the safety of the public. That is not to say, however, that an installation must be in accordance with these standards before it can be connected up. The supply authority has to state its reasons in writing for withholding supply, and the reasons given must be based on something more than failure to comply with the I.E.E. Regulations. For installations that were in existence before 1937, more latitude still is allowed to the consumer; accepted practice is not a criterion in such cases, but there must be grounds for supposing that the apparatus and wiring would not continue to function safely.

It is no easy matter for the electrical staff of an undertaking to decide where the boundary lies between good practice in general and safe practice in particular instances. For example, even the standardisation of connector dimensions may be a question of safety as well as convenience, as evidence at a recent inquest at Brighton seemed to indicate.

That non-fulfilment of the conditions prescribed in the I.E.E. Regulations does not necessarily imply a risk of danger is illustrated by the recent inability of Luton Corporation to justify its refusal to connect up an installation. The undertaking did not rely on the question of the legality of the I.E.E. Regulations as such, but the point happened to be covered by No. 201 (e), which requires the conductor of a final sub-circuit feeding a 15-A socket outlet to be large enough to carry the corresponding current.

In the installation concerned there were two final sub-circuits, each consisting of a 3/0.036 sq. in. twin t.r.s. cable looped into a 15-A socket, and thence taken on to a second 15-A socket. The application related to a supply for a 2-kW fire only, and the consumer claimed that on account of the size of the rooms and because one plug was in a sitting room and the other in a bedroom there was no likelihood of more than one 2-kW fire being in simultaneous use. Incidentally, it was contended that a demand of 3-kW could be safely met.

As the parties could not agree, an inquiry was held by an inspector nominated by the Electricity Commissioners, who found in favour of the Corporation, but the consumer exercised his right to appeal to the Commissioners themselves, who set aside the finding. Subsequently the County Court confirmed the award of costs against the Corporation.

This divergency of expert views provides an example of the difficulty of determining what constitutes a risk of danger, since there was no question that the standard of workmanship was a high one.

Worries of this kind may be largely avoided by making the I.E.E. Regulations a condition of contract. The question arises, however, as to how far interpretations placed upon them by the Wiring Regulations Committee would have weight if they did not coincide with those given on purely verbal grounds in a court of law. This contingency could presumably be avoided by including a provision in the next edition giving any official interpretations the same force as the Regulations themselves.

While sympathy will be felt with efforts to require that installations shall merit the hall-mark of excellence provided by full compliance with the I.E.E. Regulations, an undertaking must consider in each doubtful case whether a risk of danger is really likely to follow the connecting of the installation to the mains.

An Inquiry from Chile

IN last week's leading article on export trade we mentioned that the exports to Chile were apparently not of sufficient magnitude to warrant separate mention, and suggested that more attention might be given to this and other South American markets. By a coincidence we have now received a letter from a firm of merchants in Santiago who are anxious to get into touch with British manufacturers of electric cookers and water-heaters of a type and quality suitable for Chile. They mention that German competition is strong there, so that price is a special consideration. We shall be glad to pass the name and address of our inquirers to any British concerns who are interested in the matter.

Labour and Distribution

THE Trade Union Congress is the latest body to manifest hostility to the Government's proposals for the reorganisation of electricity supply. At a meeting of the General Council last week it was resolved to oppose the scheme on several grounds. In the first place it was objected that the proposals did not provide for the establishment of public ownership, and contemplated the transfer of publicly owned undertakings to private companies on a less favourable basis than transfers in the reverse direction. The matter with which the General Council is properly concerned, however, is the probable effect upon employés. In this respect it considers that the proposals made for the payment of compensation to employés who would be dispensed with or whose conditions would be worsened are inadequate. The "White Paper" merely stated that compensation should be paid to such employés without going into details. Until such details are forthcoming it is not possible to say that the provision is inadequate. What the General Council should ask for is an elaboration of the proposals, when it would be in a better position to assess their adequacy or otherwise.

The Position in China

CHINA, as is frequently the case nowadays, is again in the headlines. An astonishing feature of the past few years has been the maintenance of Chinese trade with foreign countries during the troublous times through which the country has passed. The principal thing which is now adversely affecting electrical import trade is apparently not the political situation but the increasing tendency to manufacture electrical equipment within the country. The effect is shown in the trade figures for 1936, which appear on another page, although these seem to indicate a greater fall in our trade with China than appears from the Board of Trade figures. In a recent paper read before the China Local Centre of the I.E.E. a Chinese engineer predicted that the importation of several classes of electrical equipment into China would fall considerably in the next five to ten years, if they did not cease altogether. It is difficult to ascertain what is actually happening in China, but if electrical development, which the Government is supposed to be encouraging, goes ahead at an accelerated pace there should still be scope for foreign suppliers of electrical equipment for many years to come.

Increasing the Use of Coal

IT is sometimes said that "electricity competes with coal" and is therefore responsible to some extent for the decline in the output of the mines of late years. In a lecture to the Royal Society of Arts, Professor A. W. Nash, while laying due emphasis on the effect of reduced exports as the main reason, mentioned electrification as one of the two chief subsidiary causes. The amount of coal burned in the power stations of public supply and traction authorities, however, was only 13.6 million tons in 1936, which is little more than 6 per cent. of the total tonnage won. On this occasion something, too, may be claimed on account of the inherently low efficiency of conversion from fuel to electricity (contrasted with the high efficiency of electricity in application), and a fairly simple calculation will show that it makes little difference to the net amount of coal required (regarded as quantity) whether it be used as raw material or in the refined form of electricity. Moreover, much of the coal now burned to produce electricity would not have been used except as electricity, which, by its convenience, encourages a far greater demand for B.th.u. than can be hoped for by the adoption of cruder methods.

Open Sparking

THE report on the explosion at Wharncliffe Woodmoor Colliery now available leaves little doubt that the cause was ignition of fire-damp. Sir H. Walker, Chief Inspector of Mines, attributes the ignition to open sparking at either the commutator of a loaded motor or its switch, the covers of both having been removed during routine examination. The electrician responsible was killed, and it is possible that he misinterpreted the regulations permitting the cleaning of commutators or slip rings of low- or medium-voltage motors while running. This permission, however, relates only to risk of electric shock and does not hold good in any place in which inflammable gas is likely to be present and open sparking might be dangerous.

Fish Frying

UNTIL quite recently the fish and chip trade has for one reason or another been rather sceptical of the ability of electricity to cope with its particular problems. Now, however, the electric fish and chip range is finding considerable favour. Within a year the Great Yarmouth Corporation, as we recently reported, has connected seven of these, including a five-pan range of 83 kW. Progress has also been made at Hull, where sixteen ranges had been connected up to March 31st. The annual consumption per range at Hull was between 30,000 and 40,000 kWh, and as the load comes at an opportune period of the day in relation to other demands it has been possible to offer electricity at a very economic rate.

Assistance for Gas

FROM time to time we have protested against the profits of municipal electricity undertakings being "milked" so that Councils may make a better showing with their district rates. Where a company supplies gas in such an area it not only witnesses its rival being impeded by those in control, but receives a free gift in the shape of reduced rates. What of the position where both the electricity and gas undertakings are owned by the local authority? Such is the case at Salford. A local newspaper recently reported that a sum of £15,000 is this year being allocated to the Rate Fund from the electricity undertaking's profits, but did not mention any similar action in the case of the gas undertaking. The city electrical engineer's report shows that, in addition to repaying certain deficits which occurred in the early years of the undertaking, a total of £286,284 has now been transferred to the relief of the rates. Unless the gas undertaking is contributing a commensurate amount, on the basis of its revenue, it is in the position of being subsidised by electricity.

The Panacea

IN a question to the Minister of Transport last week Mr. Kelly hinted that the electrical industry knew the solution to the specific problems arising from the proposals to reorganise electricity distribution. Dr. Burgin, however, had not been enlightened on this point. For our part, we are under the impression that there are as many solutions to the problem as there are interests involved, but if Mr. Kelly really knows the answer he should set all anxiety at rest by revealing it.

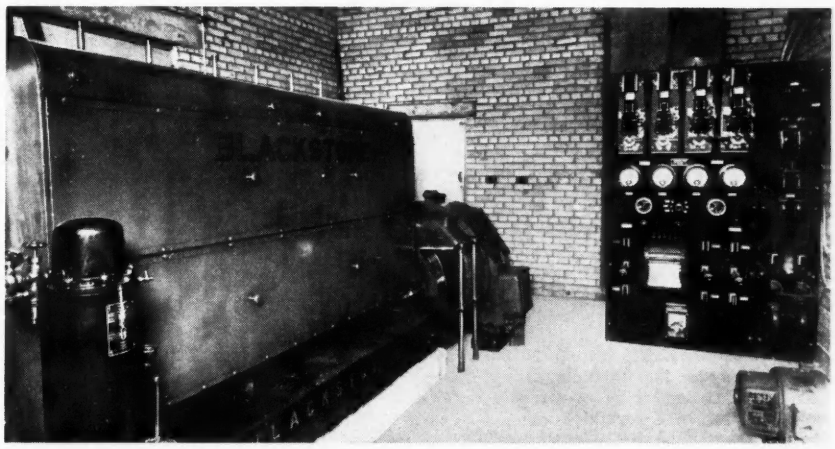
The New Earls Court

Unique supply, distribution and lighting schemes

THE provision of all the major services, including space heating, electrically—to the extent of 22,000 kW of connected load—for what is said to be largest building in the world, is an achievement for which Earls Court, Ltd., the electrical industry and, in particular, Mr. W. C. Parker, borough electrical engineer, Fulham, who, with his contract and sales superintendent, Mr. A. V. Mathias, was responsible for securing the supply competitively, have ample reason for pride.

The new Earls Court exhibition building covers about nine acres and has 420,000 sq. ft. of floor area. The main hall, with seating accommodation for 25,000, measures 350 ft. by 250 ft. between columns and 115 ft. from floor to roof, and around it the structure has four floors above the ground and basement storeys with vast exhibition spaces, restaurants and conference halls.

The 11-kV supply system, with its intake station and five sub-stations on ring mains, is equivalent to a modern scheme for a township of, say, 35,000 inhabitants, but with shorter cable runs. The very heavy load called for cables direct from the new Fulham power station, about two miles away, and the four 11-kV 0.25-sq. in. feeders are carried along the West London Railway Extension. In addition, there are two 46-core cables for protection, load control and telephone services.



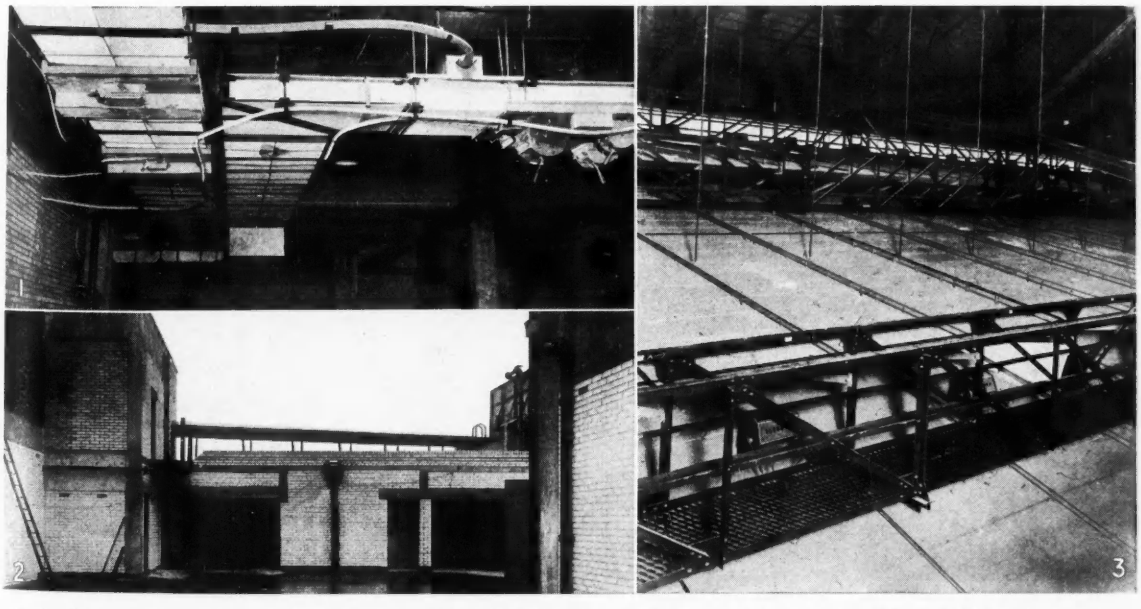
Oil-engine emergency lighting set and central board for m.g. and Diesel sets
[Elec. Rev. photo.

The circuit-breakers at the power station and exhibition ends of the cables have rupturing capacities of 750,000 kVA and 150,000 kVA, respectively. At the intake chamber a nine-panel metal-clad duplicate-bus-bar switchboard accommodates the incoming feeders, two ring-main outgoing feeders, three boiler supply cables, a bus section switch, a bus coupler switch and duplicate metering equipments. On-peak load metering arrangements provide for the summation of the energy supplied through the ring-main feeders and to the nearby Empress Hall, while the off-peak load to the electrode storage plant is metered separately by watt-hour meters. The three boiler feeder switches are electrically operated and controlled from the Fulham power station, the main switching being done in the intake sub-station. There are three sub-stations in the basement, one near each corner of the triangular building, and two on the roof—all on the 0.25-sq. in. ring main.

For a.c. supplies there are in each of the basement sub-stations two 1,500-kVA, 11,000/400-V, three-phase transformers fitted with hand-operated on-load tap-change gear, and in each of the roof sub-stations two 750-kVA transformers for the same conditions are similarly equipped. These transformers are served by metal-clad single-bus-bar 11-kV switchgear of 150,000-kVA rupturing capacity and serve low-voltage sheet-steel cubicle switchgear of 35,000-kVA rupturing capacity.

For normal d.c. supplies each of the basement sub-stations is also equipped with a 200-kV Nevelin glass-bulb rectifier, complete with the necessary distribution switchboard, and served by a 230-kVA transformer. For secondary or emergency d.c. lighting to comply with L.C.C. regulations a d.c. supply is afforded by a 200-kW motor-generator set which runs normally in parallel with a Chloride battery with a capacity of 1,500 A at the 10-hour rating. As a standby to the battery and generator plant there is also a Diesel generator set with a 4-stroke 7-cylinder Blackstone engine (600 r.p.m.) coupled to a 200-kW generator. Normally the motor generator serves the emergency lighting, the battery merely floating across the mains. In the event of a failure of the a.c. supply the battery immediately takes over the emergency lighting load until such time as the Diesel generator is running and is connected in parallel with the battery in place of the motor-generator set. When the Diesel generator is started automatically under emergency conditions the generator is motored by the battery, but for normal operation there is provision for the usual method of starting by compressed air.

All the 11-kV switchgear has bus-bar and frame protection so arranged that in the event of frame leakage the protection discriminates between the bus-bar section in such a manner as to trip the bus section switch as well as all those switches



1. Bus-bar runs from basement sub-station showing switchgear assembly and cable pick-up. 2. Roof sub-station and bus-bar run to arena roof. 3. Housing of floodlight projectors between arena ceiling louvres *[Elec. Rev. photos.*

connected to the faulty bus-bar section through which current could be fed into the fault, but without tripping the switches on the " healthy " bus-bar sections.

All the sub-stations, in common with the building generally, are fitted with " Mulsifyre " fire-fighting equipment. The contract for the main supply equipment was placed by the Fulham undertaking with Crompton Parkinson, Ltd., who manufactured the motor-generator set and the Diesel-set generator. The cables were supplied by Derby Cables, Ltd., and the transformers by the British Electric Transformer Co., Ltd.

The Distribution Scheme

From each of the basement sub-stations emerge two sets of 3-phase and neutral bus-bars which radiate one in either direction roughly round the periphery of the building. The longest of the six bus-bar runs is about 200 ft. They vary in size from 3 in. by ¼ in. single copper up to multiple 4-way bars each of the same size. Insulated by teak dividing fillets, the tinned-copper bars are carried in non-magnetic shoes bolted to cross-channel bearers which are suspended by ¾-in. rods from the ceilings by means of " Lead-Phil " plugs. To prevent " whipping " under short-circuit stress the bars are strengthened by stiffeners at selected points, the bars and reinforcement being clamped solid.

Where the bars pass through walls they are built round with " Sindanyo " heat-resisting blocks as a fire precaution. The channel bearers and corresponding members above them are continuously bolted together, thus forming a framework for the asbestos panel casing and bus-bar separating pieces in which the system is enclosed. Air gaps at the top and bottom of the casing permit heat dissipation. A continuous earth strip is run round the whole length of the bus-bar system and is bolted to each bearer. For tee-offs tongues are bolted to the bars, and in a good many cases switch-fuses controlling tee-off circuits are actually mounted on the bus-bar system.

At each of ten points around the building rising a.c. mains run vertically to the top floor, being fed from the bus-bar system and controlled by high-rupturing capacity fuses. At each floor, from the ground storey up, there is at each riser position a switch-room fed off the rising cable to a t.p. and neutral switch-fuse which serves generally three a.c. distribution switchboards, one on each phase. These switch-rooms provide all the permanent lighting and small power requirements above the basement level. With switch-fuse control separate feeders are taken from the bus-bar system for the basement lighting.

Unusual provisions are made for supplies to exhibitors' stands in the exhibition areas on the ground and first floors. Under the columns across the building lateral cables in the basement are fed from the bus-bar system *via* 600-A metal-clad vertical-isolation C.P. oil circuit-breakers. At practically every column a tee-off from the laterals affords a supply to a special distribution box recessed in one side of the column on the ground floor, serving two sets of t.p. and neutral main fuses, one for that particular box and one for the corresponding box on the next floor. Through a meter and a main switch eight sets of 3-phase and neutral terminals with fuses on the phases provide the actual exhibitors' connections, the lead-in cables being brought into the box through a slot in the top of the box front. Each box has three doors, one covering the exhibitors' connections at the top, one the main switch and meter in the middle and one (ground floor) the main fuses.

In a few positions where there are no columns exhibition stand supplies are provided by Simmonds & Stokes industrial screw-on plugs recessed in the floor. Some of these are controlled by a fuse box on which they are mounted, and in other cases a number of the plugs are supplied from a separate fuse board in a column. For the plant rooms of the heating and ventilating system, for the lifts and escalators and various other power-consuming units separate armoured cables or v.i.r. cables in conduit runs are teed separately from the bus-bars.

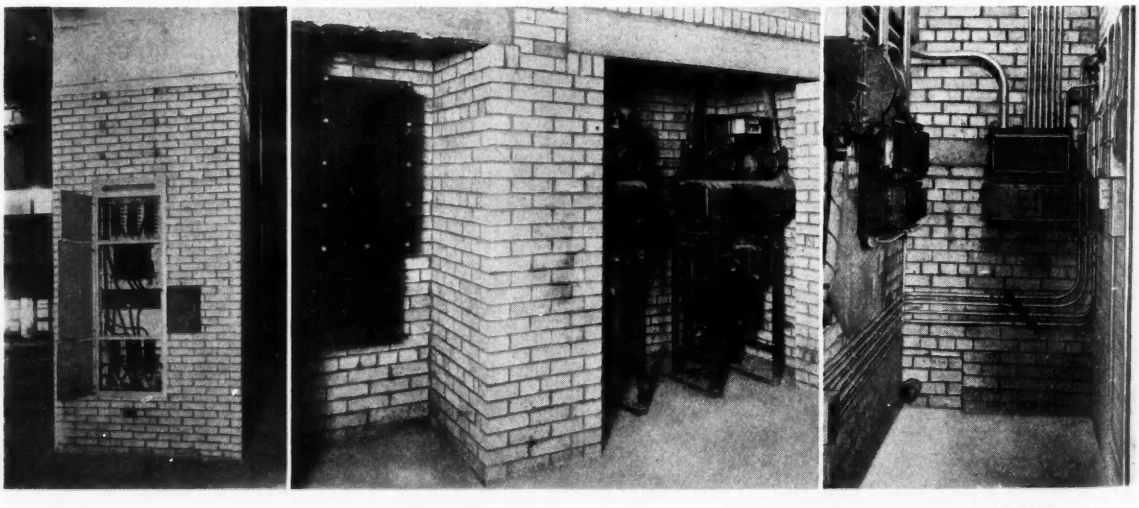
From each of the two sub-stations on the roof a bus-bar chamber is run into the roof of the main arena. These bus-bar equipments are of similar construction to those in the basement, except that in the open they are supported from underneath and have weatherproof covering. In the roof they are suspended from the permanent cat-walks. Except that there are no exhibitors' stand supplies the services from the roof bus-bars are similar to those of the basement bus-bars, the main supplies being to the special arena roof lighting and the floodlights for lighting the arena below.

[*Elec. Rev. photo.*

Arena floodlighting gallery on one side of building

Separate armoured cables are run from the roof " subs " into the roofs of the exhibition halls on the first floor for supplying the special lighting there and terminate in a main switchboard in the centre of each hall. Various plant rooms grouped around are also served from these switchboards. From the emergency lighting plant are fed two large ring mains, as well as a special feeder to the car park. One ring roughly follows the outline of the basement and the other encircles the arena roof. Ten risers are taken from the basement ring main in a manner similar to the a.c. scheme, except that they terminate in the switch-rooms on the ground floor. Each one supplies a distribution board, from which separate v.i.r. cable runs are taken to each of the upper floors.

From the roof ring main various distribution boards are fed for supplies to the secondary lighting in the main and small halls and also for the floodlighting projectors in the



[*Elec. Rev. photos.*

Left: One of the exhibition-stand distribution boards recessed in main column. Centre: Cubicle-housed a.c. (right) and d.c. circuit-breakers of exhibition-stand supplies. Right: A ground-floor switching room; left front, tee from rising main

gallery. On the opposite side of the columns in the exhibition areas are boards for exhibition-stand d.c. supplies similar to those for the a.c. stand supplies. They are supplied from lateral cables like those employed for the other scheme, the laterals being fed by the rectifying plant in the basement sub-stations *via* 150-A air-break switches (Electrical Apparatus Co., Ltd.) mounted in cubicles in the basement corridors. Practically all the switch-fuses and distribution boards were supplied by Parmiter, Hope & Sugden, Ltd., the fuses being of the high-rupturing capacity cartridge type. The distribution scheme was designed and erected by Electrical Installations, Ltd.

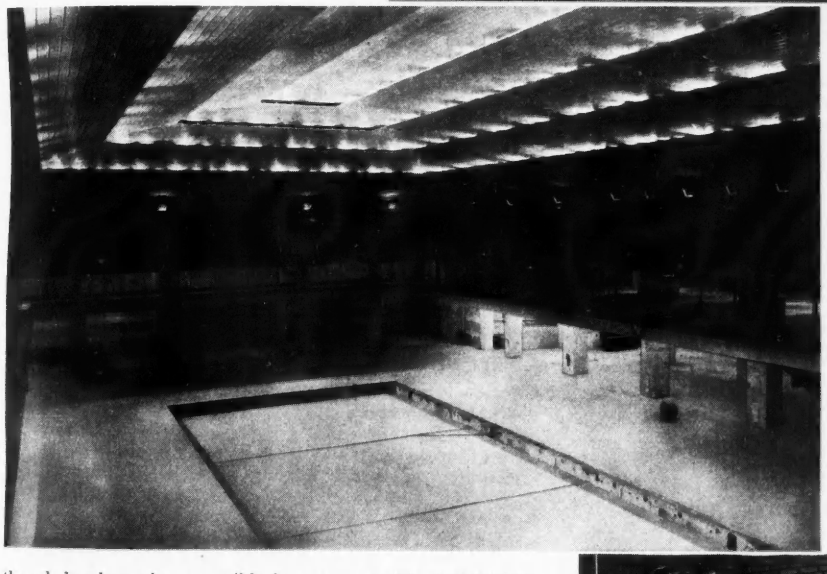
The Main Lighting Schemes

An elaborate colour floodlighting scheme is employed for the vast ceiling (400 ft. by 250 ft.) of the main arena which reflects brilliant kaleidoscopic colour lighting with continuously changing effects ranging over the entire spectrum. These effects are accentuated by the louvred formation of the ceiling with a 200-ft. by 50-ft. central area with 100-ft. by 260-ft., 150-ft. by 310-ft., and 200-ft. by 360-ft. surrounds with 3-ft. vertical spacings. In the cones formed by the louvres are concealed the floodlighting projectors, of which there are 416 all told. Each projector is equipped with a selected colour filter which affords the maximum light transmission. The horizontal spread of each beam is 90 deg. and the vertical divergence is 12 deg. The beams from adjacent projectors overlap. Tubular projector lamps are employed and the whole scheme is responsible for a connected load of 272 kW.

The lighting is automatically controlled by a specially designed thyratron reactor dimmer which is capable of controlling a lighting load of 328 kW in twelve circuits, with either cyclic or manual control. The thyratron equipment is mounted in a small chamber on the roof and no special ventilating equipment is provided for it. Around the top of the main hall is a large trough-like gallery with suitable apertures from which twenty-four 2,000-W floodlights and eleven 80-A arcs floodlight the arena proper. The arena roof and floor-lighting equipment was supplied by the British Thomson-Houston Co., Ltd., which was also responsible for the forty 500-W underwater floodlights installed around the huge swimming pool in the main arena.

Within the 50-ft. squares formed by main beams in the ceilings of the main exhibition areas on the ground floor are cross-beams which form, in all, nine squares of equal size. At each of the 32 "free" corners formed by these nine squares is nestled a triangular sheet-metal fitting with spread-preventing louvres in the bottom, which is otherwise open for downward projection, and an amber-tinted glass front for horizontal diffusion. In the centre of the middle square is a similar fitting for the secondary lighting, except that it has four glass sides. This central fitting has a 200-W lamp, and the corner fittings have 150-W lamps. A similar scheme is provided for the exhibition spaces on the first floor, except that each 50-ft. square is divided into only four squares and larger lamps are used. The whole of this exhibition-space lighting equipment were supplied by Lighting Trades, Ltd.

Specially designed large suspended fittings in the conference rooms are of two-tier construction. In the bottom tier are nine reflectors fitted with 100-W lamps and arranged for downward projection, while eight 60-W lamps are concealed in the trough reflector of the top tier. Upward projecting light from the top lamps is reflected by the sprayed silver surface of a vase on the stem of the fitting with considerable diffusing effect. The top and bottom tiers are separately controlled from the switch rooms by contactors installed in the roofs.



Both secondary and cleaners' lighting are incorporated in the bottom tiers of some of the fittings.

Special attention given to the æsthetic aspect has resulted in the installation of two-tier globe ceiling fittings with plate-glass discs in the restaurants, with relief by very attractive wall brackets. In the halls near the entrances are square, recessed ceiling fittings with louvred fronts to prevent spread. Falk, Stadelmann & Co., Ltd., supplied the fittings for the conference halls, restaurants and the halls adjoining the entrances.

Above: Lighting of ground-floor exhibition space. Left: Main arena roof lighting from balcony. Below: One of the basement sub-stations, showing main l.p. switchboard (left) and h.p. board (right)

[Elec. Rev. photos.

The heating, ventilating and other services merit special attention and will be described in our next issue.

Sparking Plugs. By A. G. Arend

Methods of Manufacture and Testing

THE complete examination of the efficiency of sparking-plugs calls for a wide experience of the small parts of which they are constructed. There are two principal sections; first, the ceramic materials for the insulated body, and, secondly, the various metallic components. The insulators are generally made in a separate factory and then despatched to the main sparking-plug factory for assembly. Each is subjected to a comparatively wide form of examination and, to save time, those known to possess recognised defects are retained as a means of comparison.

The glazed surface of the plug body is subjected to what might be termed a mild form of examination. That is, the colour and lustre are compared with standards, and the cause of any tendency to crazing is immediately investigated. When the glaze shows a definite defect, such as chipping, the plugs are returned to the glazing shop. The glaze is selected so that it expands and contracts in practically the same manner as does the ceramic material which it coats. Defects should never be so bad that they reach the stage of chipping whilst under regular service conditions, but alterations in the clay compositions employed are sometimes found to lead to this trouble.

Experienced testers simply depend on the naked eye to make this examination. The glaze is applied by a spray gun whilst the bodies of the plugs are slowly revolved on spindles. The machine is so arranged that a uniform thickness of glaze is supplied to each plug, those parts which do not need glazing being protected. No other tests are required for the glaze, as the original composition is examined chemically and electrically.

Production of Clay Bodies

The clay body is first made by reducing the raw material to a creamy consistency, when it is filter-pressed to the form of slabs, and continuously rolled until all air inclusions have been removed. As the colour of the product is not always consistent, the mass is impregnated throughout with dye. Should the colour appear in streaks, further rolling is necessary. At this point, the clay should have the consistency of a stiff putty, but microscopic examination reveals that it possesses a much finer texture. The pressing of the bodies is next done in a hydraulic machine, which extrudes the clay at a considerable pressure. A plunger meanwhile makes the central hole for the electrode.

The bodies are transferred to trays which are continuously passed through an electrically heated kiln. This does not completely dry the body, but simply removes the bulk of the moisture, and converts it to the consistency of stiff rubber. In this way the mass is in suitable condition for turning, and also adapting the hole for the electrode. This machining is expected to ensure a uniformly shaped body, and when completed, the units are passed along an endless belt, where specimens are selected for inspection as regards size and shape.

After glazing the bodies are placed on small travelling carriages and run into electrically heated kilns. A fixed period of heating and a specified temperature is accorded, after which the hot bodies are cooled as rapidly as possible. The most satisfactory method of cooling is by passing the heated bodies directly from the hearth to a chamber fitted with water-cooled jackets. All temperature changes are registered by recording pyrometers. The finished insulator bodies are now ready for assembling with the metal parts.

Metal Parts

The hexagons are specially milled from round bars. This is done in sections which cut different faces until the final hexagon shape has been formed. Rolling wheels mark the faces as required and the recessing operations are done with the assistance of a counterbore fitted with side-cutters. Glands and nuts are machined in the same shop, and the products are directly transferred to the assembling department. No inspection other than that of periodical checking of the measurements is required for this work.

The shells of some makes are frequently examined to see that they are of sound metal suitable for welding. Prior to welding, the plug body is subjected to burning whereby all oil or grease remaining on the surfaces is removed, after which the latter are oxidised. Metal which has not been properly oxidised leads to corrosion troubles with the sparking plug under ordinary service conditions. Tests are made of the oxidised surface by placing the plug bodies in hot and cold water, and selected rain water so as to follow the conditions which obtain in everyday use.

The nickel wire used for the plugs is fully examined prior to cutting off in suitable lengths for welding to the shells. The welding machines, which are provided with transformers to give a comparatively high current density at low voltage, are placed underneath the wire cutter, and hold the shells vertically. The wire is cut, passed through small straightening rolls, and connected to the shell. The welding operation is performed almost instantaneously, the use of revolving tables economising time. As the electrode has to be firmly cemented to the insulator body, this part of the work must not be unduly hastened.

Cement is forced in until a surplus emerges from the surface, when the electrode is screwed home and the excess cement brushed off. The cement is dried by heating the body gently in small electrically heated trays. The actual welding operation requires little skill as the machine holds the wire in position, and the current fuses the attached points of both shell and wire.

Copper washers are made from the best electrolytic metal, and are generally tested electrically prior to attaching to the sparking plugs. They have to be carefully pressed into position by compressed air machines; this work is controlled by electrical recorders. The washers are forced into the plug, and their positions periodically checked by measurement. Provided the copper possesses the desired physical characteristics of strength and ductility, a fixed number of pounds of compressed air will ensure a close fit.

The gland and centre when assembled are expected to be gas-tight, and the final closing of the plug body is done under heat. Electric heat is again applied, and by means of suitable cooling arrangements, only the middle part of the shell is raised to red heat.

The machines are small but compactly built and the loosely assembled parts of the plug are returned as the finished unit. Air pressure cools the hot plugs as they emerge from the machine. The heat causes the ring of the shell to contract or draw in to a certain extent and in order to prevent damage to the plugs at this point some makers use a number of water-cooled dies.

Final Inspection

Inspection is made to ascertain if this final heating has in any way impaired the properties of the metal parts. The plugs are finally washed and left with a slight film of oil on the surface to prevent corrosion.

When the best metal is used, the electrode should retain the same sparking voltage throughout its life. It should not be adversely affected by corrosion from the gases or different climatic conditions. That is, in cold weather, the use of proper electrode metal should assist starting.

After protracted service, the electrode should give practically the same spark provided the gap width is maintained. Where the best metal is employed, a wide range of temperature changes should not affect the electrode. Spark examinations should be made in conjunction with tests for gas-tightness, when the plugs are subjected to a considerable air-pressure. The insulation is tested by applying thousands of volts depending on the specification.

Platinum-iridium and platinum-rhodium points formed by direct welding or by electro-plating give different results from those of nickel and nickel alloys, but efforts are being made to make a success of the latter for economic reasons. To secure the desired resistance of the points to heat and corrosion all examinations are supplemented by microscopic investigations of the metal itself, and this has materially assisted research work.

A Javanese Hydro-electric Station

The main conditions governing the design of the recently completed hydro-electric station at Tjinangling, near Batavia, Java, were that the whole of the volume of water available is required continuously and that the water level in the intake basin must remain constant. The flow varies seasonally between 25,000 and 40,000 gal. per min., and the h.p. of each of the two Escher-Wyss Francis-type turbines is based upon the lower figure, which gives 1,700 h.p. individually. Either can be run during the dry season, to drive a common 2,250-kVA, 1,000-r.p.m., 6.3-kV alternator. During the rainy season the combined set is in use, full-load on the alternator corresponding to 75 per cent. of the hydraulic capacity. The net head is 245 ft. One oil-pressure regulator governs both turbines.

The new station, for which the Siemens-Schuckertwerke was responsible, is unattended and comes into operation on making alive the line connecting it with one of the three other stations with which it runs in parallel on a 25-kV overhead system extending for thirty-three miles. Voltage relays close an oil circuit-breaker by means of compressed air and synchronise the alternator.

Rectifiers for Arc Welding. By S. G. P. de Lange

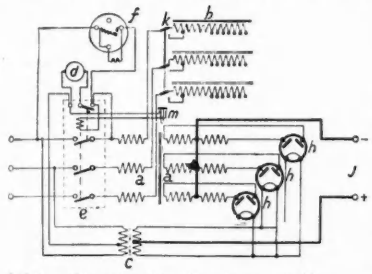
The scope of d.c. and a.c. methods

THE oxide-cathode rectifying tube for the conversion of a.c. into d.c. has proved its practical worth in welding. For five years these units have been operating in all parts of the world, and their particular applications can now be defined. These include:—(1) The welding of sheet metal of 22 s.w.g. to 12 s.w.g. for mild as well as stainless steel. (2) Difficult work such as vertical and overhead welding. (3) The welding of special metals, such as stainless steel, bronze and aluminium.

The welding rectifier may also be used advantageously in every case where formerly a welding transformer or motor generator has been employed. Welding with the rectifier is easier and smoother, according to the operator, and for comparatively long welding periods the average speed will be improved, principally due to the electrical characteristics of the plant.

Philips welding plant at the Taylor Bell Foundry, Loughborough

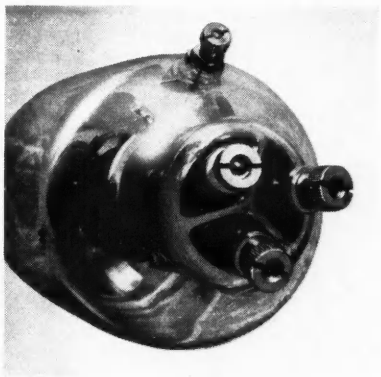
The most important component of the rectifier is an evacuated tube, which contains one or more anodes and a filament, and an energising transformer for increasing the number of phases for rectification. Auxiliary components are fuses and switches. Heated by means of a special transformer, the filament glows and liberates electrons. The moment one of the anodes becomes positive relative to the filament these electrons are attracted to it and a direct current flows in the opposite direction, from the anode to the cathode. When the anode is negative no current flows.



Wiring diagram for six-phase rectifier
a, 3-phase—6-phase transformer; b, regulating choke with tappings; c, filament current transformer; d, fan motor; e, magnetic switch; f, slow-acting relay; h, rectifying valves; j, d.c. terminals; k, switch for current control

A rectifying tube with one anode will supply from a 50-cycle system sinusoidal current impulses for 0.01 sec., followed by intervals of similar duration. The curve of the current delivered can be improved by connecting a second anode in such a manner to the transformer (the number of phases of its secondary coil being doubled) that the currentless intervals are replaced by equal current impulses.

A system whereby the number of secondary phases has been sextupled incorporates three pairs of phases on the three legs of the transformer, the centre tappings of the three coils being interconnected. This results in six sinusoidal phase voltages. As soon as the phase voltage of one of the anodes attains a positive value higher than that of any of the other five, d.c. will flow over that anode until another anode attains a higher voltage. The current obtained approximates to actual direct current and it can be smoothed still further by means of chokes.



Construction of valve

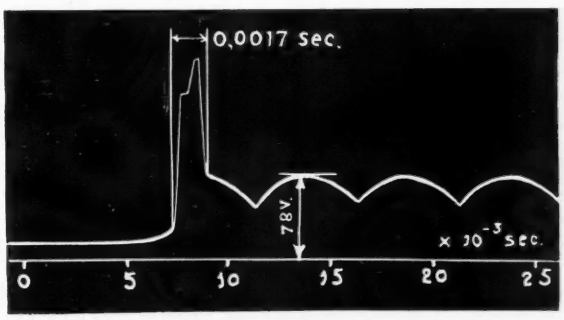
The rectifier is wound for any three-phase supply and is air-cooled. The current range is adjustable in thirty-eight steps from 25 to 200 A according to the nature of the work and the type of rod used.

After an arc has been struck its length, as well as the minimum striking voltage necessary to maintain it, increases. There now begins a race between the minimum striking voltage and the voltage of the plant. If the latter lags behind, then the arc will break and must be struck again. Each break of more than a fraction of a second may cause a weakness in the weld, hence the importance of the immediate adaptation of the voltage of the plant to that of the arc.

In this particular, the welding rectifier possesses advantages over the welding convertor. The direct voltage supplied by the convertor is directly proportional to the field of the poles of the welding dynamo. This field cannot change suddenly, because of the opposing effect of the currents in the excitation coils, and perhaps also of the heavy material of the poles and of the yoke. With the welding rectifier this danger is non-existent as there is no excitation coil. In certain types of welding dynamos this difficulty is circumvented for the greater part by means of the special circuits as well as the lamination of the yoke and the poles.

Such improvements increase the price, but do not bring the dynamo up to the standard of the welding rectifier. Oscillograms have shown that the time necessary for the recovery of the no-load voltage after a short-circuit due to striking of the arc amounts to 0.002 sec.

These advantages of the welding rectifier are of the greatest importance in welding sheet metal. Some years ago the difficulties encountered in welding sheet metal of 20 s.w.g. and less by the electric arc was responsible for the view that gas welding would be the only satisfactory means of dealing with sheet metal. It was felt, however, that electrical methods would considerably facilitate and improve sheet-metal welding, especially as regards distortion and warping of the material, quite apart from the easier control of the fusion of the sheet metal on account of the concentrated heat supply. Moreover, arc welding tends to give a much better welded joint and deeper penetration.

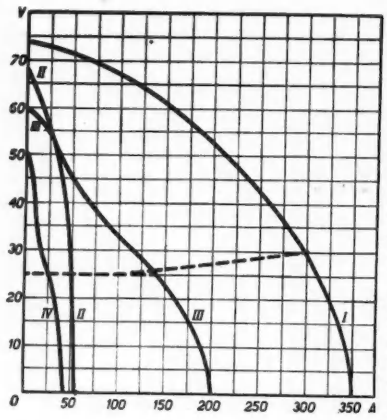


Oscillogram indicating the direction of voltage when interrupted at maximum short-circuit current

Strict Control of Current Intensity

One difficulty was the risk of burning right through the material, a danger which increases in proportion to the thinness of the metal. It is of the utmost importance—much more so than in the case of heavier work—that the current strength should never be exceeded, even momentarily. It is therefore essential to exercise rigid control over the current intensity. Investigations have shown that plant suitable for the welding of sheet metal should have the following properties: D.c. output, fine and accurate current control, absence of electrical inertia, and a quiet and flexible arc, not likely to break. Welding rectifiers comply entirely with such requirements.

The rectifier is most suitable for welding special work where a very high standard is required of the plant and rods or where very small currents are employed. For ordinary work d.c. with the welding rectifier does not offer considerable advantages as regards welding properties over a.c. with a transformer. The difference in welding with more than 140 A is, as a rule, only slight.

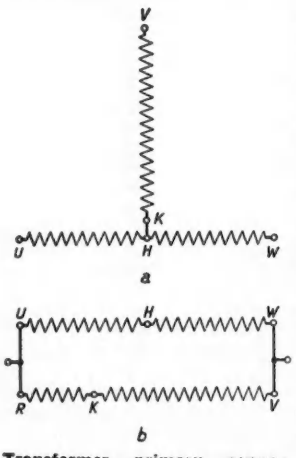


Characteristics of dual-current welding machine. I and II, a.c.; III and IV, d.c.

As the initial cost of the transformer and maintenance are lower than those of a d.c. welding plant, the transformer is generally preferred for normal work and a d.c. plant for special work. The current output of the transformer in connection with the anodes of a welding rectifier gives the plant a dual sphere of application, and costs less than two separate equipments. This has led to the development of the dual-current welding machine.

The plant is connected to a three-phase supply and is provided with a special switch; in one position the plant works as a welding transformer and in the other as a welding rectifier. The centre position of the switch is neutral and breaks any connection. This apparatus also contains three single-phase grid-leak transformers, the dispersion characteristics of which can be changed by displacing a magnetic grid-leak bar. This enables the operator to regulate continuously the welding current within wide limits.

When the switch is in the position for d.c. welding the transformers are tee-connected to each other on the primary side. They convert the three-phase current of the mains into four-phase current at a low voltage which is rectified by means of the tubes. When the plant is adjusted for a.c. welding one of the mains phases is disconnected. The two single-phase transformers are now in parallel between the two other mains phases; the four secondary coils, which formed the radii of the four-phase star connection for d.c. welding, are now also connected in parallel, and each supplies one quarter of the welding current.



Transformer primary connections (a) for d.c. and (b) for a.c.

In the diagram of the circuit arrangements, when the switch is in the d.c. position the points U, V and W are connected to the phases of the mains and H is connected to K. The coil K to R remains currentless. The secondary coils form a symmetrical four-phase star, of which the star point is connected to the negative terminal. The positive terminal is situated in the centre of the filament-current windings, which have been coiled round the primary coils, the voltage of which is therefore independent of the load.

When the switch is in the a.c. position the connection between the points H and K of the primary coil is interrupted; U is connected to R and W to V and the pairs of terminals are connected between two phases of the three-phase mains, so that the fields of the two transformers are in phase with each other and do not differ by 90 deg. as they did previously. The ends at the left of the four secondary coils are now connected to one of the terminals and the ends at the right-hand side to the other terminal. The filament heating coils are interrupted and the tubes are cut out.

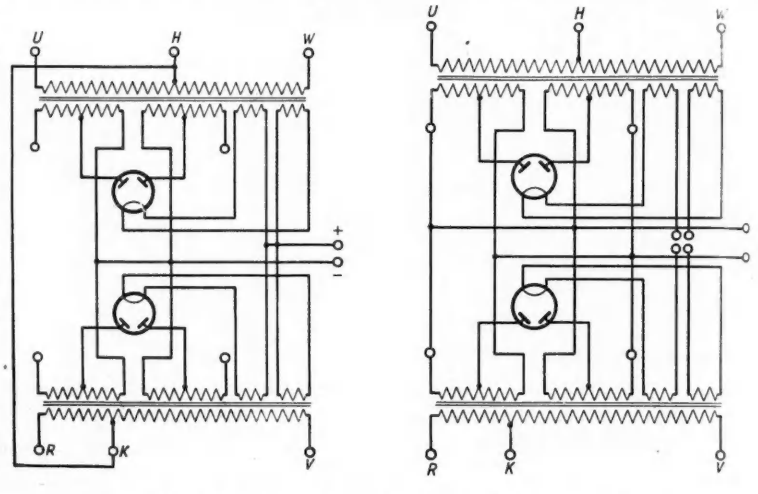
The secondary coils are increased by a few extra windings when used in this way so that the open-circuit voltage reaches the high value essential for a.c. welding. These extra windings are on top of the primary coil, and thus the grid-leak reactance enables that value to be attained when the plant supplies 300 A a.c. with the leak bar in its maximum position. This maximum value of 300 A is due to the practical consideration that good welding should be made possible with thickly coated rods of 2 s.w.g.

Acknowledgments are due to Philips Lamps, Ltd., in regard to the information given in this article.

A System-Coupling Convertor Set

THE Societa Tecnomasio Italiano Brown-Boveri, of Milan, is at present constructing a system-coupling convertor set for the works of the Acciaierie e Ferriere Lombarde Falck-Milano at Spigno Monferrato, Italy, which is interesting both as regards its lay-out and the conditions under which it is to work.

A vertical-shaft synchronous machine is connected to the three-phase system of the Italian State Railways. It is designed for an output of 9,000 kVA at 500 r.p.m., 3,500-4,000 V, 16⅔ cycles, and is coupled, on one side, to a hydraulic turbine and, on the other, to an induction machine to allow,



Left: Circuit for d.c. welding. Right: Circuit for a.c. welding

alternatively, of connecting up to the 6,300-V, 50-cycle, and 5,100-V, 42-cycle industrial systems. The frequency changer for the separately-placed Scherbius regulating motor is on the same shaft above the induction machine and over the supporting bearing at the top and on the same shaft there is also a small auxiliary generator.

Apart from the arbitrary and alternative exchange of power between the two systems, independently of the frequency fluctuations of the system, or solely dependent on the frequency oscillations on the railway system, the following operations are possible:—When connected to the Scherbius regulating motor, the induction machine can run as a pure phase advancer, its reactive output being 5,000 kVA at 6,300 V, 50 cycles, and 4,000 kVA at 5,300 V, 42 cycles; it can run as an induction generator and also as a phase advancer, the commutator machine regulating the reactive loads so that the generator delivers between 6,500 kW at a 100 per cent. power factor and 7,500 kVA at 0.86 p.f. when connected up to 6,300 V and 50 cycles. When connected up to 5,300 V 42 cycles it can give 5,400 kW at unity power factor and 6,300 kVA at 0.86 power factor.

The active power delivered by the generator is covered by the hydraulic turbine. The induction machine can, however, also work, unconnected to the Scherbius unit, as an uncompensated induction generator giving 6,500 or 5,400 kW at 0.86 power factor to the 50- or 42-cycle industrial systems, respectively.

The double-type Scherbius regulating machine is built to run at 750 r.p.m. and is coupled to a three-phase starting motor with wound armature. The excitation current required for the synchronous machine connected to the railway system is furnished by a special set composed of a three-phase motor and a main and an auxiliary exciter. A further exciter set composed of a driving motor and three-phase commutator machine, which have been designed as a double unit, is provided to furnish the excitation for the Scherbius regulating machine.

High-intensity Light Sources.

By J. A. V. Fairbrother, Ph.D.

FOR the projection of light in one direction within a fairly small angle a small source is required, as a paraboidal reflector to give equivalent results would be much larger than practical considerations would permit.

The lower limit to the size of light source is set by its brightness (intrinsic brilliance) and the quantity of light obtainable from it. Intrinsic brilliance is the candle-power divided by the projected area of the source on a plane normal to the direction of view, and is conveniently measured in candles per sq. mm. Since the brightness of a luminous object can change with the direction of view, the latter must always be specified.

For bodies which emit full or temperature radiation the intrinsic brilliancy increases rapidly with the temperature up to the melting point. As carbon and tungsten have the highest melting points of all terrestrial substances the carbon arc and the hot tungsten filament are the two high-intensity light sources most commonly used for projection purposes. The eye is sensitive only between the wavelengths 3,700 and 7,500 Angstroms and but a small fraction of the radiation emitted from a hot body falls within this region. Only at about 6,000 deg. C. does the peak of the spectral emission curve from a hot surface fall into the visible region, when about 20 per cent. of the energy is emitted as light. For higher and lower temperatures the percentage becomes rapidly less. A hot body is thus inherently an inefficient convertor of energy into light, and it is preferable to use a substance for which a great proportion of the energy input required to excite it to luminescence is emitted as light. An early light source, making use of the selected radiation from cerium and thorium nitrate, was the Welsbach mantle, but most promising of all is the selected light emission from gases and vapours, the molecules or atoms of which are excited by the passage of an electric current.

Practical applications of this method are mercury-vapour lamps. Recently by exciting mercury vapour at a high pressure in a quartz envelope a light source has been obtained not only with a higher light efficiency than overrun tungsten but of higher intrinsic brilliancy.

Tungsten

Gas-filled tungsten-filament lamps up to 10 kW are used extensively for cinema projection and for spot lights and broadside lights in studio illumination. Lamps of 0.5 kW are made for epidiascope work. These high-power lamps are also used for floodlighting buildings and airport landing grounds, and in searchlights and beacon lights. In general, the luminous efficiency of projector lamps of this type increases with the wattage. A 100-W projector lamp for home-cinema projection has an efficiency of about 16 lumens per watt, whereas a 5-kW spotlight lamp has an efficiency of as much as 30 lumens per watt.

TABLE I.
BRIGHTNESS AND LUMINOUS EFFICIENCY DATA FOR TUNGSTEN.*

Temperature, deg. K.	Watts radiated, per sq. cm.	Normal brightness, candles per sq. mm.	Luminous efficiency, lumens per watt.
2,500 ...	67.6	2.375	11.67
2,600 ...	80.8	3.47	14.28
2,700 ...	96.2	4.98	17.26
2,800 ...	112.9	6.94	20.43
2,900 ...	132.1	9.49	23.80
3,000 ...	153.9	12.57	27.10
3,100 ...	177.5	16.47	31.0
3,200 ...	203.0	21.10	34.6
3,300 ...	232.0	26.85	38.5
3,400 ...	264.0	33.70	42.6
3,500 ...	300.0	42.20	45.9
3,655 (M.P.)	360.0	57.40	53.1

* Worthing and Forsythe, *Astrophys. Journal*, Vol. 61, p. 146.

For projection work light outputs are usually not less than 2,000 lumens, which is too great to be obtained in practice from a single strip of tungsten, so that the light source is composed of a grid of tungsten spirals. The average intrinsic brilliancy of its surface must on no account of the spacing between the filaments be less than the i.b. of the tungsten wire itself. It is the object of the designer to reduce the spacing as much as possible.

The filament of a 5-kW projector lamp runs at a temperature of about 3,350 deg. K, some 300 deg. below the melting point of tungsten, and has a normal life of 100 hr. The filament consists of six spirals arranged in the form of a flat zig-zag grid of overall dimensions 30×36 sq. mm. Its total light output is not less than 140,000 lumens, with an efficiency of 28 lumens per watt.

Now the horizontal candle-power of such a lamp as this in a direction at right angles to the plane of the filament is about 20 per cent. greater than the mean spherical candle-power and is therefore equal to 140,000/$4\pi \times 1.2 = 13{,}400$ candles. As this comes from an equivalent area of 30×36 sq. mm., it corresponds to an average intrinsic brilliancy of 12.4 candles per sq. mm.

The relative brightness of modern lamps

A straight filament operating at 3,350 deg. K. has a luminous efficiency of 40.5 lumens per watt and an intrinsic brilliancy of 29 candles per sq. mm. Due to the spiralling the luminous efficiency is only 69 per cent. of this, and the intrinsic brilliancy only 43 per cent. in the horizontal direction. If a reflecting surface could be placed behind the plane of the filament so as to reflect back between the open spaces the light which would be lost from the back side, the intrinsic brilliancy could theoretically be doubled and the maximum i.b. obtainable would be about 25 candles per sq. mm. for a life of 100 hr. Alternatively, one or more groups of filaments could be placed behind the first in staggered formation so that the whole when viewed from one side appeared as a solid surface of glowing tungsten. In this manner the i.b. in a particular direction could be increased, but the luminous efficiency would be considerably reduced. By the time a value of i.b. had been reached equal to 25 candles per sq. mm. the luminous efficiency would have dropped to too low a value to represent a reasonable compromise.

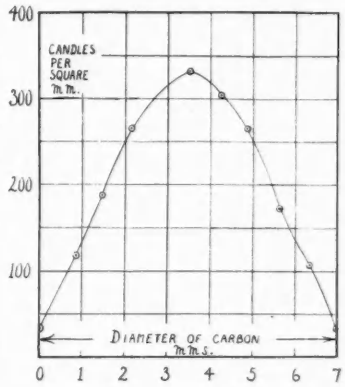


Fig. 1.—Variation of intrinsic brilliancy across a Morganite 7-mm. dia. high intensity carbon arc crater operating at 44 V, 50 A

We may take it then that hot tungsten light sources with a reasonable life and luminous efficiency cannot be made with an intrinsic brilliancy greater than 25 candles per sq. mm., and in practice the value is usually about 12 candles per sq. mm.

The Carbon Arc

The brightest light source of all is the carbon arc, about 70 per cent. of the light from which comes from the crater in the positive carbon, where the temperature of the interior reaches about 4,000 deg. C. or some 6000 deg. above the melting point of tungsten.

The intrinsic brilliancy of a plain carbon crater at its hottest point is about 130 candles per sq. mm., which is more than twice that of tungsten at its melting point. By making carbons with cores of highly refractory substances which radiate selectively in the visible region, intrinsic brilliancies of from 300 to as high as 750 candles per sq. mm. can be obtained—about half that of the sun. Such carbons range from 7 to 16 mm. in diameter and the arc currents range from 30 to 150 A at from 40 to 80 V.

The results of measurements I have taken on a projector lantern, using a high-intensity positive carbon, are shown in fig. 1. The maximum intrinsic brilliancy is 330 candles per sq. mm. and the average across the diameter is 220 candles per sq. mm. This is about eighteen times the average intrinsic brilliancy of the 5-kW tungsten-filament spot lamp.

These measurements were taken by focusing an enlarged image of the crater of the arc by means of a lens into a pin-hole camera, the photographic plate of which was replaced by a light-sensitive cell of the photo-generator type. The camera was mounted so that it could be moved across a diameter of the image of the crater by means of a screw, the travel being read off on a vernier scale. The current response from the cell was proportional to the light flux passing through the pin-hole, which in these experiments was a hole 0.005 in. diameter drilled in a nickel sheet 0.002 in. thick. The area of the hole divided by the square of the linear magnification is equal to the area of the source from which the measured light flux is emitted. The candle-power corresponding to the measured light flux can be calculated from the geometry of the optical system, and the ratio it bears to the emitting area gives the intrinsic brilliancy of this part of the source. The light-sensitive cell was calibrated for the carbon arc light by measuring the horizontal candle-power of the arc photometrically, using a Lummer Brodhum head. The current response from

a known carbon arc light flux on the cell was then measured.

When intrinsic brilliancy measurements are being made the light entering the pinhole does not flood the cell, and, in order that the calibration shall be applicable, the cell must have a uniformly sensitive surface. The ft.-candles falling on the cell throughout the experiments must be kept below the point at which the current is no longer proportional to the light flux falling upon it.

E.H.P. Mercury-vapour Lamps

When an arc is struck between suitable electrodes sealed into a glass envelope with a filling of metallic mercury, the tube is completely filled with the characteristic blue glow of ionised mercury vapour. If a sufficiently large current is passed the watts liberated increase the temperature of the tube and the mercury-vapour pressure and the glow becomes more intense. When the temperature has risen to 250 deg. C. the arc begins to contract towards the axis of the tube. With a sufficiently refractory glass the temperature can be raised to as high as 400 deg. C., when the arc becomes a very bright cord stretched along the axis of the tube the space adjacent to the glass walls being comparatively dark. The voltage drop per cm. of arc length is at this stage about 10 V, the mercury-vapour pressure an atmosphere or more and the luminous efficiency about 40 lumens per watt—more than three times the efficiency of the tungsten-filament lamp. Yet in spite of the high luminous efficiency the intrinsic brilliancy is low. The light flux in a horizontal plane passing through the centre of a 400-W lamp operating in a vertical position is emitted from an arc area of about 6 in. × ¼ in. This corresponds to an average intrinsic brilliancy of 0.76 candles per sq. mm. and a maximum of about 1.5 candles per sq. mm., whereas the average value of i.b. for high-power tungsten-filament projector lamps is 12 candles per sq. mm.

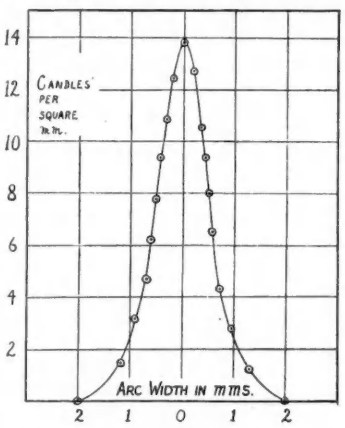


Fig. 2.—Intrinsic brilliance of a 75-W, air - cooled, h.p. mercury - vapour quartz lamp. Average i.b. = 4.5 candles per sq. mm. Horizontal candle power = 180 per cm. arc length

The contraction of the arc to form a luminous cord along the lamp axis becomes greater as the mercury-vapour pressure is increased, but this can only be done by using a refractory and transparent envelope, through which metal electrodes can be hermetically sealed, which will withstand the high internal pressures. Quartz is a suitable substance as it melts at about 1,700 deg. C. and retains its high elasticity and transparency for prolonged periods at temperatures as high as 900 deg. C. The problem of making metal seals to withstand the high temperature has now been solved, and molybdenum leads can be sealed directly into fused quartz, the seals remaining vacuum tight up to 1,000 deg. C. Since quartz has a thermal coefficient of linear expansion one-tenth of that of the hardest glasses it can withstand great temperature differences without cracking.

TABLE II.
DATA RELATING TO LIGHT SOURCES OF HIGH INTRINSIC BRILLIANCE.

Type of illuminant.	Temperature, °C.	Lumens per Watt.	Average intrinsic brilliancy, candles per sq. mm.	Maximum intrinsic brilliancy, candles per sq. mm.
Carbon arc (plain carbon).	4,000° C. (generally accepted).	?	155 (commonly quoted).	238 (estimated).
Carbon arc (Morganite h.i. 7 mm. cored carbon).	?	15 overall. 20 arc only.	220 (measured at 50 A. 44 V.).	330 (measured at 50 A. 44 V.).
Carbon arc (h.i. 14-mm. carbon; 120 A.).	?	?	490 (estimated).	750*
Tungsten (5-kW projector lamp).	3,080° C.	28	12.4	29 (I.B. for the actual tungsten surface).
Tungsten (100-W 110 V pre-focus cap projector lamp.).		16	4.3	10 (approx.).
H.p. mercury-vapour (400 W).	?	45 initially. 37 average.	0.75	1.5
E.h.p. mercury-vapour quartz lamp (air cooled, 75 W).	?	42 initially.	8.4 (for 90% of the light).	14
E.h.p. mercury-vapour quartz lamp (water cooled, 700 W).	?	50 initially.	170	280

* Joy and Downes, *Jo. Soc. Mot. Pic. Engineers*, p. 291, March, 1930.

Mercury-vapour quartz lamps are now being made which operate at internal wall temperatures up to 900 deg. C. and internal mercury-vapour pressures upwards of 200 atm. These lamps are small, one model designed for operation in air at 75 W having a total length of 60 mm. and an outer diameter of not more than 8 mm. The length of the arc from which practically all the light is emitted is less than 20 mm. and the effective arc width is not more than about 2 mm.

The intrinsic brilliancy of such a lamp has been measured according to the methods already described for the positive crater of the carbon arc, and the variation of intrinsic brilliancy across the width of the arc is shown in fig. 2 from which it is seen that the maximum value of intrinsic brilliancy is 14 candles per sq. mm. The curve is very peaked and the average i.b. taken across the width of the arc is about 32 per cent. of the maximum or about 4.5 candles per sq. mm. If only the middle portion of the curve is utilised, of width 2 mm. (this means neglecting only 10 per cent. of the light output) the average intrinsic brilliancy over this area is 8.4 candles per sq. mm. Curves of average i.b. maximum i.b. and horizontal candle-power maximum h.c.p. for increasing arc widths (*i.e.*, the band widths obtained by expanding equally on either side of the maximum i.b. ordinate on the curve) are shown in fig. 3. The values of i.b. considered in practice in the design of projection equipment will be average values and are only given significance if the arc width is simultaneously specified.

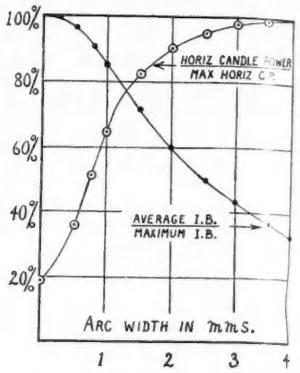


Fig. 3.—Relationship between average and maximum intrinsic brilliancy and between average and maximum horizontal candle power at varying arc widths

Another extra h.p. mercury-vapour quartz lamp, which has its temperature kept relatively low by cooling water in contact with the outer wall of the envelope, has an arc length of only 10 mm. and can be operated for short periods at an input as high as 700 W, when the i.b. is increased by some twenty times to a maximum of about 280 candles per sq. mm. This is about ten times the i.b. of the tungsten filaments in modern projector lamps, about twice that of the plain carbon arc, about 85 per cent. of that obtainable from modern high-intensity small diameter cored carbons, and nearly half that obtainable from the largest and most recent high-intensity cored carbons.

From this it is seen that the water-cooled high-pressure lamp approaches the carbon arc in intrinsic brilliance, and is more than twice as efficient. It surpasses in both respects all other illuminants.

The carbon arc must be continuously adjusted, the crater kept central and mechanism provided for feeding the carbons at the same rate as they are burned. The vapours which are liberated must be carried away and safety from fire has to be considered. Moreover, the crater cannot be placed close to optical parts on account of the heat and vapours developed.

The water-cooled extra-high-pressure mercury-vapour lamp suffers from none of these disadvantages. For the same light output it requires a much smaller wattage input and heat is carried away by the cooling water. The light source remains fixed in position throughout its life. Further research is needed in order to ascertain whether it can be made to operate with a reasonable life under the conditions which render its use attractive.

Acknowledgments are due to the British Thomson-Houston Co., Ltd., in whose laboratories the measurements on the carbon arc and high-pressure mercury-vapour arc were carried out.

Standard Fuses

The British Standards Institution has revised Specification No. 88 for electric fuses which was published in 1931. A larger range is included, extending the ratings up to 800 A when the voltage to earth does not normally exceed 250 V. The performance tests are considerably more searching than in the old specification, and the tests are dealt with in greater detail. The performance is no longer based on the "1.6 and 1.9 limits," but on the fusing factor, minimum values of which are specified for the various standard categories of duty. A short-circuit test is also included to determine the suitability of a fuse for its duty. Copies of this Specification (No. 88-1937) may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d. post free.

H.V. Tee-off Arrangements. By John McCombe, Ph.D.

Methods for overhead rural systems

AFTER the main lines have been completed it is necessary to erect branch lines in order to provide duplicate feeding points for towns and supplies for villages, etc. When a branch line is required a tapping is taken direct off the main line from a single, double or A pole, as the case may be. Difficulty is often experienced with the connections relative to obtaining the requisite phase-to-phase and phase-to-earth clearance since provision has to be made for stays and, on the larger spur lines, for protective fuse-gear. A satisfactory and cheap method of tapping lines up to 33-kV without going to the expense of elaborate control switchgear is detailed in the following notes.

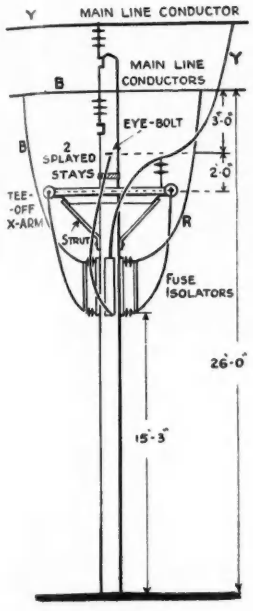


Fig. 1

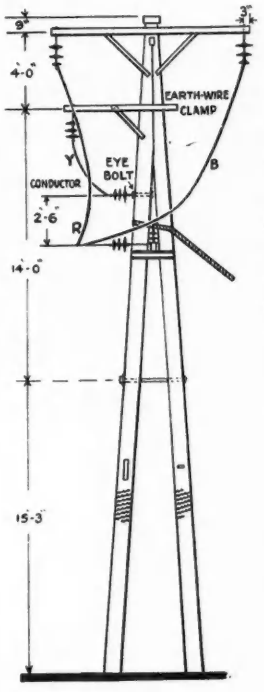
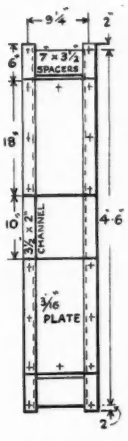


Fig. 2



DETAIL OF TEE-OFF CROSS ARM

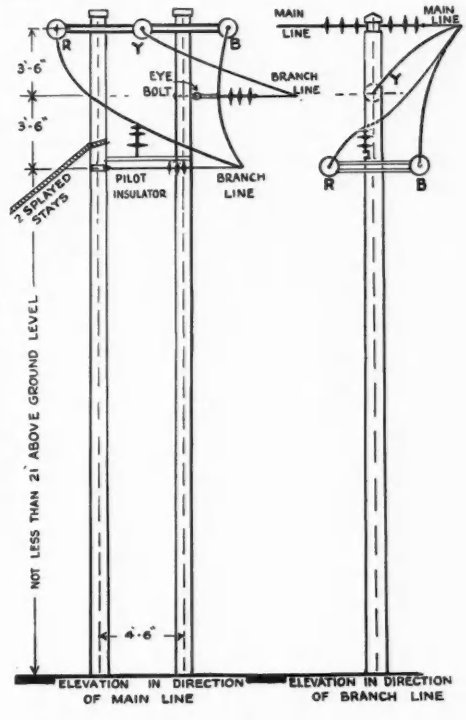


Fig. 3

Where a branch has to be taken off a single pole the general arrangement is as fig. 1. The tee-off cross-arm, for the outside phases of the branch line, is erected at not less than 21 ft. above ground level, while an eyebolt 2 ft. above this takes the centre phase. Two splayed stays are fitted 8 in. above the cross-arm and in a direction opposing the spur line. If the pole is higher than normal height then the cross-arm can be fitted at a higher level and a 3 ft. spacing between it and the eyebolt adopted.

If the branch line is at an acute angle to the main line a tee-off arm as fig. 4 is used, as no provision has to be made for pilot insulators since the connections from the main line to the fuse isolators and from the fuse isolators to the branch line are straightforward. If the branch is taken off at right angles to the main line provision must be made for pilot insulators for the jumper connections. A cross-arm, as shown in the left-hand photograph, in which the plates have been drilled for pilot insulators, is used.

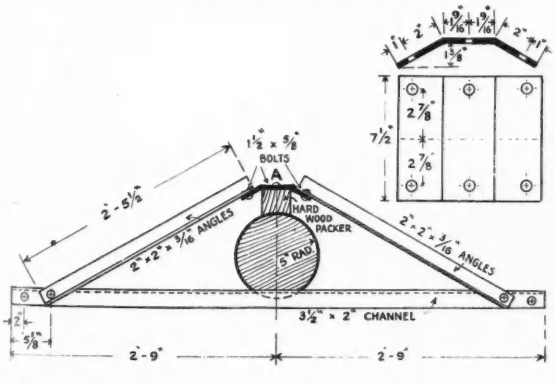
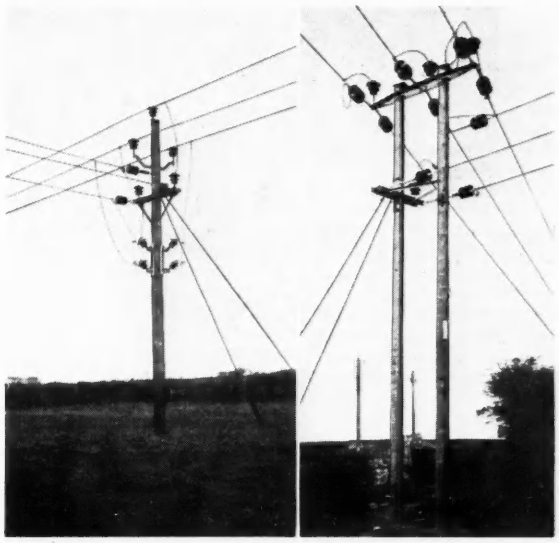


Fig. 4

A-pole Tee-off

A method of taking a branch off an A pole is shown in fig. 2. The lower tee-off cross-arm, item A, is fitted at 22 ft. above ground level to take the outside phases. An eyebolt 2 ft. 6 in. above this takes the centre phase. The cross-arm is bolted to the two 4 in. × 2 in. channels which have previously been erected on the pole. If isolating fusegear is required, fuse isolators can be mounted on the pole legs, connection being facilitated by the use of pilot insulators on the cross-arm. Two splayed stays are fitted against the branch line.



Left: Pole with cross-arm plates drilled for pilot insulators. Right: An H-pole tee-off

H-pole Tee-off

Where an H pole exists the method of branching off is as detailed in fig. 3. Where the spur line is at approximately

The New Factories Act.

By J. W. Thomas, B.Sc., LL.B., M.I.E.E.

Its application to electrical stations

THE Factories Bill has received the Royal Assent and is now law. Several changes were made in the Bill during its passage through Parliament but the one which is probably of greatest importance to electricity supply engineers concerns its application to electrical stations. When first introduced into the House of Commons the Bill included within the definition of a factory any premises in which persons were employed in manual labour and in which electrical energy was generated, converted or transformed for supply by way of trade or for the purposes of traction on any railway, tramway, or other means of public conveyance or for the purposes of any industrial or commercial undertaking or of any public building or public institution or for the lighting of streets or other public places.

The basic feature of this definition was that persons must be employed in the electrical station, and further, they must be employed in manual labour, otherwise the station would not be deemed to be a factory within the meaning of the Bill. It was obvious that this definition might exclude from the scope of factory legislation those electrical stations which are unattended and in which no persons are employed.

Whilst it might be contended that even in these unattended stations occasions were bound to arise when persons would be working in them, if only for cleaning, overhauling or repairing purposes, and that this would be sufficient to meet the requirements of the definition, there would always be uncertainty until the Courts had given a definite ruling on the point.

Again, the limitation imposed by the term " manual labour " might lead to controversy. This term is recognised to have very uncertain scope and this is particularly the case in electricity supply, where the border line separating manual operations from technical supervision is so indistinct. There might be electrical stations in which all the switching operations and duties of inspection were carried out by the supervisory staffs whose employment might not be deemed to be by way of manual labour. In such cases doubts might again arise whether such stations fulfilled the requirements of the definition and whether, in fact, they were factories within the meaning of the Act. It was clearly undesirable that a decision whether an electrical station was a factory or not should depend upon such ambiguities, particularly as the question of danger is largely unaffected by whether persons are employed in the station in manual labour or otherwise.

Switching Stations

There was another defect in the definition inasmuch as it did not cover those sub-stations in which neither convertors nor transformers are installed, but in which operations on high-voltage switchgear are carried out. There are several large switching stations of this type and their number is likely to increase. The people who have to perform switching operations in these stations or who have to inspect them periodically are just as liable to be exposed to danger as they would be if transformers were installed. The mere absence of transformers does not materially lessen the danger and there would appear to be no good reason why such switching stations should be exempt from the provisions of the Act, particularly those relating to safety.

The omission of switching stations has always been regarded as a serious defect in existing factory law and it appeared that the new Bill was to perpetuate it. Soon after the Bill was introduced, representations were made from certain quarters that the provisions relating to electrical stations should be amended so as to remedy the above-mentioned defects, and amendments were put forward for this purpose during the committee stage in the House of Commons. The Government was not altogether unsympathetic. The Under Secretary for the Home Office frankly admitted that some switching stations were dangerous and that, in fact, they were just as dangerous as convertor and transformer stations, though he did not agree that the number of accidents in them had been very large. He assured the movers of the amendments that the Government did not wish to burke the point regarding switching stations but it had found difficulty in devising an entirely logical line of demarcation between the Factory Acts and the powers of the Electricity Commissioners.

An important question was involved whether switching operations should come within the Factory Acts or be left to the Electricity Commissioners, who were also concerned with questions of safety in electrical stations. He referred to one of the additional regulations in the new Regulations of the Electricity Commissioners which imposed upon electricity undertakers the obligation of taking reasonable precautions during and in connection with the installation, extension, replacement, repair and maintenance of any of their works so as to avoid danger to the public or to any employé or authorised person engaged on such operations, and he suggested that the movers of the amendment should study this regulation and if they were not satisfied then further consultations would take place with the Electricity Commissioners. He, himself, promised to take the matter up again in order to see whether any strengthening of the position ought to be made, and in view of his assurance the amendments were withdrawn.

Three Classes

The Government evidently gave the matter further consideration in consultation with the Electricity Commissioners and people interested in the supply industry. During the report stage in the House of Lords the Earl of Munster moved the substitution of a new clause to deal with electrical stations. The effect of it was to extend the meaning of the term " electrical station " and also to omit the reference to persons being employed therein so far as certain types of stations were concerned.

The new clause divides electrical stations into three types :–

(1) Premises in which persons are regularly employed in or in connection with the processes or operations of generating, transforming or converting, or of switching, controlling or otherwise regulating electrical energy for supply by way of trade, or for supply for the purposes of any transport undertaking or other industrial or commercial undertaking or of any public building or public institution, or for supply to streets or other public places. These premises will be deemed to be factories and all the provisions in the Act will apply to them. Although it is a basic condition in respect of these stations that persons shall be regularly employed in them, there is no condition that they shall be employed by way of manual labour. Thus the ambiguities which might arise in discriminating between manual and non-manual labour are avoided.

(2) Those premises in which the above-mentioned processes or operations are carried on or performed for such a supply, in which no persons are employed, but which are large enough to admit the entrance of a person after the machinery or plant therein is in position. With regard to these premises, only certain of the provisions of the Act are to apply, *viz.*, those relating to safety and health and to the powers and duties of inspectors and regulations and orders of the Secretary of State, &c.

It will be noted that there is no condition in regard to persons being employed in this type of station but there is a limitation in respect of the size. A station in which a person cannot enter after the machinery or plant is in position will not fulfil the requirements of this definition and, therefore, will not be subject to the provisions mentioned. One might venture to suggest that many kiosks which have been erected up and down the country, in which it is impossible for persons to enter when the machinery or plant is in position will be excluded from the scope of this definition though one may anticipate some interesting arguments as to what is meant by a person being able to enter a premises. A good deal of controversy, however, will probably be avoided by the further provision in the new clause, which will enable the Secretary of State, by special regulations, to apply any of the provisions relating to safety and inspection, &c., mentioned in the previous sub-clause to any machinery or plant used elsewhere than in premises previously mentioned, so long as the machinery or plant is used in the processes or operations for such supply. Thus the new clause makes provision for a third type of premises, *viz.*,

(3) Those which contain machinery or plant used in the processes or operations of generating, transmitting, converting, switching, controlling or otherwise regulating electrical energy for supply by way of trade, &c. (which may not be large enough to admit the entrance of a person after the machinery or plant is in position). These premises are not deemed to be factories within the meaning of the Act, nor will the provisions mentioned in the previous sub-clause regarding safety and inspection necessarily apply to them, but the Secretary of State will be empowered to make regulations regarding

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H.V. Tee-off Arrangements

(*Continued from preceding page*)

right angles to the main line the cross-arm is fitted at not less than 20 ft. above ground level and on the leg of the pole remote from the branch line.

If, on the other hand, the spur line is at an angle to the branch line the cross-arm is fitted on the leg of the pole adjacent to the branch line. The centre phase is carried on an eyebolt 3 ft. above the cross-arm. Two splayed stays are fitted against the tee-off. If fuse isolators are to be fitted on the pole then pilot insulators are necessary. The other photograph shows an H-pole tee-off.

safety and inspection, &c., which will apply to the equipment in them. Thus a point about which there has been considerable doubt during the last few years, *viz.*, whether small kiosks are covered by the H.O. Regulations, will eventually be solved. At the present time the question whether a kiosk is a factory depends upon the legal interpretation of the definition of electrical station in the principal Act of 1901. Under the new Act the Secretary of State is empowered to decide whether a kiosk is to be covered by the Home Office Electricity Regulations or not.

There is a final provision in the clause that except in so far as the Secretary of State may, by special regulations, direct, the provisions appertaining to the types of stations mentioned in (1) and (2) shall not apply to any premises where the aforesaid processes or operations are only carried out or performed for the immediate purpose of working an electric motor or working any apparatus which consumes electrical energy for lighting, heating, transmitting or receiving messages or communications or other purposes of a similar character.

Electrical Progress in the I.F.S.

AN increase of 31,742,495 kWh in sales during 1936-37 is recorded in the annual report of the Irish Free State Electricity Supply Board just published. Revenue at £1,590,455 shows an increase of £153,516 and the surplus of income over expenditure, after payment of interest to the Minister of Finance and the discharge of interest and repayment of capital in respect of liabilities assumed with the acquisition of local authority undertakings, amounted to £377,422, an increase of £67,484. An increase of £84,089 in working expenditure is largely due to increasing costs of operation and maintenance and repair of plant.

Additional capital amounting to £703,653 was expended during the year, as compared with £573,340 in the preceding year, and the total capital now advanced by the Minister of Finance in respect of the Shannon works and of extensions to plant carried out by the Board amounts to £10,848,141. A sum of £243,000 has been allocated as the annual contribution to the depreciation reserve, and the balance of £136,773 on the profit and loss account is transferred to general reserve.

During the year the Shannon networks were extended to twenty-four new areas, bringing the total now served to 256. This involved extensions to transmission and distribution lines totalling 370 miles. Consumers increased by 13,779 to 130,483, and the total kWh sold numbered 218,758,085. The average price per kWh sold fell from 1.84d. to 1.74d., tariff reductions including the introduction of a "unit" charge of a halfpenny, above a specified consumption, for domestic consumers on the two-part tariff throughout the country. The table below analyses sales of electricity :—

	kWh Sold. Year ended March 31, 1936.	Year ended March 31, 1937.	Percentage increase.
Domestic	47,521,688	59,645,102	25.5
General lighting	24,207,203	26,532,901	9.6
General heating, cooking and water heating	19,710,315	21,472,442	9.0
Motive power	62,335,192	72,631,570	16.5
Public lighting	11,035,530	12,014,701	8.9
Traction	20,095,565	22,794,070	13.4
Miscellaneous	2,110,097	3,667,299	—
Totals	187,015,590	218,758,085	17.0

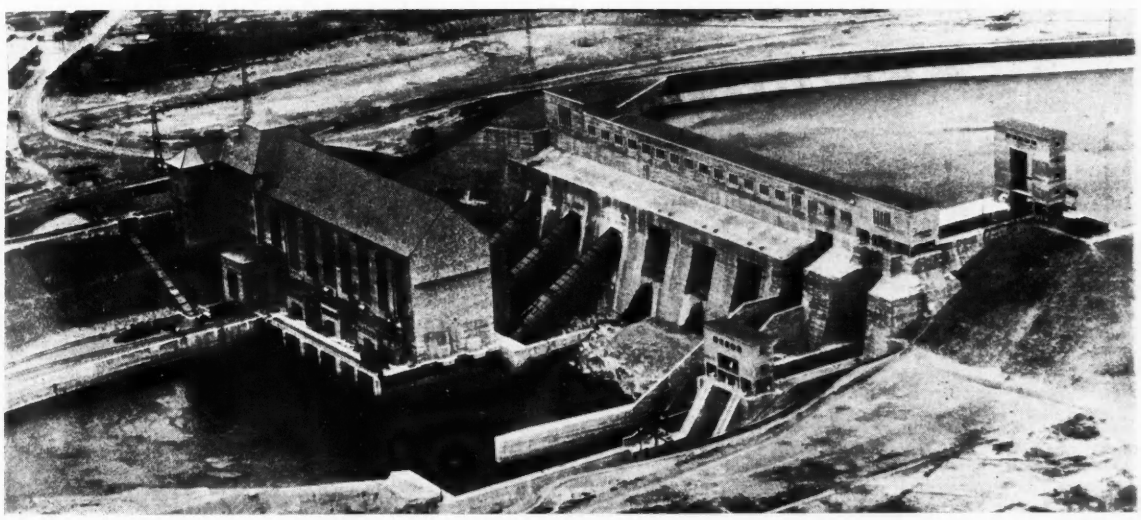
Public appreciation of the economy and advantages of domestic electrical appliances is becoming more and more widespread, particularly in Dublin and its suburbs, where, in the design of new houses, the introduction of electric heating, cooking and water heating, and the liberal provision of wall-sockets are being accepted as standard practice. In Dublin City the use of electricity for domestic purposes has doubled during the past three years while in the Dublin suburbs there has been an increase of 190 per cent.

The Board anticipates that the consumption for lighting in the country areas will continue to increase rapidly, as the standards are still relatively low. Electricity sold to public institutions, hotels, restaurants, schools, &c., for heating, cooking and water heating showed an increase of 9 per cent. in the year, and a distinct increase of public interest was apparent, resulting, in particular, in the installation of large cooking plant. The Board arranged an intensive educational campaign among the hotel and restaurant trades.

An interesting table given for the first time analyses the industrial uses of electricity :—

	kWh Sold for Industrial Motive Power. Dublin City.	Cork City.	Rest of country.	Whole country.
Year ended March 31st.				
1934	23,046,000	7,735,000	11,858,000	42,639,000
1935	26,040,000	9,064,000	14,887,000	49,991,000
1936	29,807,000	12,436,000	20,092,000	62,335,000
1937	31,911,000	14,842,000	25,878,000	72,631,000

Over the country as a whole the increase in electricity consumption for public lighting was 8.9 per cent. The Dublin Corporation has decided to provide, within the next three years, new lighting in the principal streets of the central city area. In the Dun Laoghaire area the Council has adopted proposals for improved lighting on all the main traffic routes and in all residential areas.



McConnell-Hartney, Ltd., Dublin

The Shannon power station at Ardnacrusha which produces 83 per cent. of the I.F.S. Electricity Supply Board's electricity

Receipts from the sales of appliances amounted to £73,475 for the year, as compared with £53,096 for the previous year, an increase of about 40 per cent. The net profit was £2,903. Omitting electric lighting fittings and electric lamps, some 14,000 appliances were sold. The Installations Department carried out work to the value of £64,807, as compared with £47,032 for the previous year, with a net profit of £4,596.

The total electricity generated amounted to 283,702,000 kWh, of which 246,398,100 kWh was supplied by the Ardnacrusha power station, 37,160,100 kWh by the Pigeon House (Dublin) station and 143,800 kWh by the Cork station.

The greater portion of the works involved in securing additional water storage at Lough Allen have been completed and approximately three-quarters of the storage (110,000,000 cu. metres) is now available. Various improvements, including the placing in commission of a new 25,000-kVA turbo-generator unit and two steam boilers, have been effected at the Pigeon House station and arrangements have been made to install a further turbo-generator plant of 20,000-kW capacity, together with two boilers (125,000 lb. of steam per hour each) and a 20,000-kVA transformer.

Parliamentary News (BY OUR SPECIAL REPORTER)

The Distribution Proposals

In the House of Commons on July 28th Mr. Kelly asked the Minister of Transport if the Government had yet got in draft a Bill to provide for securing co-operation and mutual assistance among electricity supply undertakings in order to assess the efficiency of each undertaking, and if he was aware that the solution to the specific problems was well known in the industry.

Mr. Burgin said that a Bill dealing with the reorganisation of the distribution of electricity supply was being drafted. In the various representations which had been made to him he had not as yet found that one specific solution of the complicated problems involved was well known in the industry.

Dispute at Luton

Mr. Kelly asked the Minister of Transport if he was aware that the official auditors of the Luton Corporation had refrained from signing the Corporation's accounts since 1934 on account of a dispute between the Central Electricity Board and the Luton Corporation; that similar disputes between the Central Electricity Board and other supply undertakings existed, such disputes being of more than one year's duration; and if he would lay before the House information on such cases and say what steps he proposed to take to bring such disputes to an end.

Mr. Burgin said he had no jurisdiction to intervene in these cases, but he understood that the Luton Corporation had applied to the Electricity Commissioners for the determination of certain questions and that, at the request of the Corporation, a hearing was being fixed immediately after the holiday recess. He understood that the Commissioners would shortly issue their decision upon the only other similar application before them.

Electric Heating in Council Houses

On July 29th Mr. McEntee asked the Minister of Health for what reason the Luton local authority had been refused sanction to install electric heating points in its Council houses, the cost of which was to be met by loan, and whether it was the policy of his department not to sanction the installation of heating points in Council houses.

Sir Kingsley Wood said he was anxious that rents on municipal housing estates should be kept at as low a level as possible—a position which could only be maintained by the exercise of reasonable economy. The houses erected by the Borough Council were, in his opinion, already provided with reasonable heating facilities, and, although he was always ready to give consideration on their merits to proposals for the provision of conveniences and amenities, he was not satisfied that the proposal in question was justified.

The Factories Bill

On Friday last week the House of Lords agreed not to press an amendment to the Factories Bill to which the House of Commons could not agree and the Bill later received the Royal Assent and became law.

In the Courts

Alleged Defect in a Fitting

In the King's Bench Division on July 28th Mr. Justice Hawke resumed the hearing of the action brought by Mrs. Ruth Dransfield, of Bournemouth, under the provisions of the Fatal Accidents Act, 1846 and the Law Reform (Miscellaneous Provisions) Act, 1934, against British Insulated Cables, Ltd., to secure damages in respect of the death of her husband, Mr. H. Dransfield, who at the time of his death was a linesman in the employ of the Bournemouth Corporation. Mrs. Dransfield sued on behalf of herself and her three infant children. (The previous proceedings were reported in the ELECTRICAL REVIEW of June 18th.)

The material facts were that in November, 1935, the Bournemouth Corporation was engaged in converting its tramways to trolley-bus operation, and on November 19th, 1935, Mr. Dransfield was knocked off the platform of an overhead wagon, sustaining a fracture of the skull, from which he died soon afterwards. The plaintiff alleged that the accident to her husband was due to the breaking of a "bull-ring" through which the trolley-bus wire was passed and which had been manufactured and supplied by the defendants to the Corporation, and that the accident was caused by the negligence of the defendants on the ground that the bull-ring was of inferior metal, joined by means of a butt weld which was defective in that fusion had only taken place over about one-third of the surface of the section.

The defendants denied that the accident to Mr. Dransfield was due to their negligence. Alternatively, they pleaded that if the bull-ring was defective because it was not strong enough for the purpose for which it was being used, or by reason of the defects alleged by the plaintiff, such condition was discoverable by the Corporation, its servants or agents after the bull-ring had been supplied. Defendants further said that they had no knowledge of any of the defects in the bull-ring alleged by the plaintiff, and denied that in the circumstances they were under any duty to the deceased man in the matters complained of.

Mr. Justice Hawke, having held on the previous occasion that he considered there was *prima facie* evidence of negligence in the welding, and on that issue evidence having been given by Mr. Lionel Bray, head of defendants' welding department, his Lordship allowed an application by counsel for the plaintiff to amend the statement of claim by adding that no test had been applied to the bull-ring to ascertain the stress it would bear, and that the ring had not been properly examined for the existence of defects. This amendment having been made, the action now again came on for hearing.

Mr. Tucker, K.C., for the plaintiff, having indicated to his Lordship the nature of the amendments, said that he had evidence to show that there was negligence in the manufacture of the bull-ring by over-heating and failure to apply a proper test. He submitted that to show specific acts of negligence was really immaterial.

On July 30th Mr. Justice Hawke, after hearing lengthy arguments by Mr. Tucker, K.C., representing Mrs. Dransfield as to her right to maintain the action against the defendants, and Mr. Sellers, appearing for the defendants, reserved his judgment until October 12th, that being the first day of the Michaelmas sittings.

Alleged Defect in a Lift

In the King's Bench Division on July 30th Mr. Justice Finlay delivered a considered judgment in the case of Smith against Vacher and Sons, Ltd., printers. The plaintiff, Mr. John Smith, a van driver, was employed by a firm from whom the defendants had ordered some type. On May 20th last year the plaintiff, in delivering a type frame to the defendants, helped their employés to put it into a lift. His case was that in order to make his way out of the lift he had to crawl between the frame and the top of the lift and whilst doing so the lift suddenly started. While plaintiff was being pulled clear the lift again started and he sustained injuries. The lift was of a type which was designed not to move when the gate was open and it was alleged, on behalf of the plaintiff, that the lift was defective and that responsibility for that rested on the defendants.

The defendants denied negligence and said that the plaintiff should have acceded to a suggestion by one of the defendants' employés that the lift should be moved up before he attempted to get out.

Mr. Justice Finlay, in giving judgment, held that the defect in the lift could have been discovered had adequate measures been taken for proper inspection of the lift. The evidence disclosed that there had been no regular inspection by the makers and that in the circumstances the defendants were liable. He awarded the plaintiff £300 damages and costs.

Sequel to Mine Accident

At Hamilton Sheriff Court last week two mine workers, not being electricians or competent persons acting under an electrician, were charged with having in the pit bottom of Broomfield Pit, Netherburn, Lanarkshire, undertaken work where technical knowledge and experience were required in order to avoid danger, namely, the repair of an electric cable of a conveyor motor, whereby serious personal injury was caused to a workman.

The prosecutor explained that respondents were working at the colliery when the conveyor motor broke down owing to a flexible electric cable bursting. Repairs of this nature were supposed to be executed by an electrical engineer employed for that purpose, but the respondents took part in the repair of the cable. What happened was that the conductor wire was connected and someone said "Switch on." The injured man did so and received a shock. For respondents, an agent stated they regretted that the offence resulted in someone being injured. The accident took place on a Saturday, after working hours had been shortened, and work was being speeded up. The electrical engineer was absent that day, and the respondents took part in the repair so that the work should not be hindered. Fines of £2 and £1 were imposed.

Radio Patent Action

The Court of Appeal on July 29th delivered judgment on the appeal of the defendants in the action brought by Electric and Musical Industries, Ltd., and the Boonton Research Corporation, Ltd., against Lissen, Ltd., and G. Kalis, the appeal being brought from the judgment of Mr. Justice Luxmoore in the Chancery Division, holding that the appellants (defendants) had infringed the plaintiffs' letters patent for "Improvements in electric wave amplifying apparatus" for use in wireless receiving sets and dismissing the counterclaim by the appellants for revocation of the plaintiffs' letters patent on the grounds of want of novelty, want of subject matter, prior user and insufficiency.

The Judge granted the plaintiffs, Electrical and Musical Industries, an injunction and an inquiry as to damages against both sets of defendants with costs, Mr. Kalis being ordered to pay the costs of the action against him so far as

not increased by the joinder of the Boonton Research Corporation which costs so far as increased to be paid by the Corporation upon the ground that it had assigned its interest in the patent prior to the issue of the writ and had not proved any infringement during its ownership of the patent against Mr. Kalis.

Lord Justice Romer read the judgment of the Court (consisting of himself, the Master of the Rolls and Lord Justice Scott), holding that the plaintiffs' invention had been anticipated. The defendants' appeal was accordingly allowed and the plaintiffs' patent revoked, but on the application of Mr. Trevor Watson, K.C., appearing for them, the order for revocation was directed to lie in the office until October 31st next pending an appeal by the plaintiff companies to the House of Lords.

Action Against E.T.U. Fails

In the Chancery Division on July 28th, before Mr. Justice Farwell, the hearing was concluded of the action brought by Mr. H. V. L. Ross and other members of the London Central Committee of the Electrical Trades Union in which the plaintiffs sought an injunction restraining the Union from expelling them from membership and a declaration that a resolution of expulsion passed by the Executive Council was *ultra vires*. The Union contended that the plaintiffs had wrongfully encouraged " unofficial " strikes at Earls Court and that the men had been properly expelled.

At the close of the plaintiffs' case Mr. Grant, for the defendants, said that at Earls Court last year three different contractors were engaged at the building on electrical installations of various kinds. In October and November the men complained of the conditions, and claimed from the employers a payment of 1s. a day during those months. Negotiations started, and on December 31st the employers offered to pay a lump sum of £50, which the men refused. There was nothing to prevent the men going on working, but they chose, on their own initiative, without communicating with anyone, to go on strike.

At a meeting on January 5th the men were told that the strike could not be made official. The London Central Committee, instead of endeavouring to get the men back to work, went on paying them subsidies until February 15th, when they returned. That conduct, said Mr. Grant, on the part of the Committee might be considered to have brought injury or discredit on the Union. The rules of the Union did not lay down that the plaintiffs were entitled to be present at every meeting at which the question relating to them was discussed. He submitted that the action failed and should be dismissed.

Mr. E. W. Bussey, the president of the Union, gave evidence that, in his opinion, the plaintiffs' case had been conducted by the Union in a judicial manner.

In giving judgment Mr. Justice Farwell, having stated the facts, said that all the plaintiffs were honestly of opinion that the Executive Council ought to have recognised the strike, but the Council had perfectly honestly taken the view that it could not recognise the unofficial strike in any way, and, that being so, it was the duty of every member of the Union to follow the Council's decision. In doing what it did the Council had complied with the rules, and, there being no *mala fide*, the Court had no jurisdiction to interfere with its decision, and the action must be dismissed, with costs.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Electrode Steam Boilers

We have read with interest the article on " Industrial Heating " by Mr. E. M. Ackery in your issue of July 23rd. He mentions that there is no electric steam boiler and steam storage plant in this country. This is now correct as the only plant which was working was that of three 500-kW steam boilers and a large steam accumulator at the Buttercup Poultry Farm, Edinburgh, which was recently totally destroyed in a disastrous fire which swept through the numerous wooden buildings of the farm.

It should be mentioned, however, that there are over a hundred electrode steam boiler installations in this country working on various industrial processes without storage. Quite a number of these plants are between 150 and 500-kW loading and they are therefore, if not of great size, by no means small.

London, W.C.1, BASTIAN & ALLEN, LTD.,
July 29th. F. J. CAMPBELL ALLEN, *Director.*

Electricity and Gravitation

In connection with your leaderette in to-day's issue, "To the Diffident," there is a further point to add which I think will interest your readers—the unnecessary use of mathematics which so frequently frightens engineers from what might develop into a most interesting discussion. When engineers meet and interesting subjects arise in conversation, a pencil and sketch pad may occasionally be required to illustrate some practical detail, but it is most unusual for a whole mass of formulæ to be required. Yet, when the same subject matter appears in print, there is the formulæ to extinguish interest, as a collection box in a crowd.

As an example : the subject of " Electricity and Gravitation " can be very interesting, but immediately " gravitation " is mentioned the mathematicians dash in and destroy the artistic or creative side of the engineer, yet it is this side of the engineer which supplies the material for the mathematician.

I consider that discovery depends upon the spiritual or inspirational side of a man by which he " senses " a truth which he then seeks. His discovery of this truth may arrive in some tangled form which the mathematician can reduce to order; but the mathematician can never discover, because he must work on discovered fact. I submit the matter for your consideration because it seems so necessary to free the pioneering and creative side of the engineer from the increasing stranglehold of the text-book. The latter is useful provided it can be laid aside and the facts made the servant and not the master of the individual.

To revert to the subject of " Electricity and Gravitation," this is now brought down to a mathematical basis. Figures are produced to prove that loss of " lift " is the result of loss by radiation. Its rather like stating that a candle when half burned loses half weight. But I am rather interested to see if it will occur to these correspondents that the earth is not a laboratory test specimen which may lose weight by radiation, but receives some of the radiation " lost " by the sun, so the mass of the earth should increase and therefore gravitation will be affected. Once tremendous radiation from the sun is accepted as a hypothesis, its effect can be considered as a " field " in which the earth revolves as an armature; terrestrial currents and gravitational force can then follow. Distortion of this field by other planets and the direction of the terrestrial currents are also understandable; but the subject is in the hands of the mathematicians, whereas there is clearly room for electrical engineers' opinions. From this viewpoint much that causes trouble with transmission might be better understood by a study of the gravitational subject.

Liverpool, *July 30th.* A. G. BULLEN.

Gas Rings on Electric Cookers

The recent case in the Courts relating to gas rings on electric cookers once more revives the old cry, " Electric cooking is slow ! " We in the electrical retail trade know that the heavy flat-bottom utensil is essential, but I, like many others, very often find great difficulty in persuading people to buy them; in fact, as soon as they are told they must buy or hire them they often refuse to have electric cooking, as they would have to scrap their existing utensils, which is a very serious matter for working-class people.

I have overcome this objection by using the old-fashioned flat-bottom iron saucepans which can be bought very cheaply. I am using them myself and have never bought a special heavy flat utensil and find that the old iron saucepan gives better results than the aluminium.

I find it better to give people this tip and sell a cooker than to try to make them buy the special utensils with it and not make a sale. H. S. TRINDER.

Earlsfield, S.W.18. *July 30th.*

Southgate and the Northmet Co.

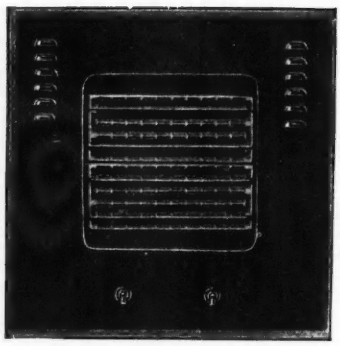
At the last meeting of the Southgate Borough Council before the vacation the Finance Committee reported on the agreement entered into in 1923 with the Northmet Co. under which the latter pays £5,000 per annum (from 1923 to 1938). It was stated that there was a proviso that if the balance carried by the company (as undertakers under the Order) to the net revenue account should in any of the seven years be less than the balance for the year 1922, then the sum of £5,000 payable on the ensuing August 2nd should be reduced by a percentage equal to the percentage by which the said balance was less than the balance for 1922 (£13,963). As reported in the local Press, the company has now intimated that, subject to audit, the balance to the credit of the revenue account in respect of the operation of the undertaking for the year 1936 was £9,058, the decrease being due mainly to reduction of charges; as a result the amount payable to the Council was £3,243, of which £2,500 had already been paid. When a member of the Council raised the question whether the Council was entitled to ask for a detailed financial statement of the Southgate undertaking, the point was left over for investi gation.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Domestic Equipment

Several new inset fires have been introduced by FALK, STADELMANN & Co., LTD., 83-93, Farringdon Road, London, E.C.1. These include the "Princess," a 2-kW model with the actual reflector-type fire set diagonally in a square frame, and the "Duchess," a low-priced model constructed of heavy gauge sheet metal and finished in oxidised copper. The "Monarch" is of unusual design, stamped from 20-gauge aluminium with chromium reflectors and wall panels of asbestos finished in black enamel heat-resisting cellulose. The "Viceroy" is a modern design of chromium plated fire. Other types include the "Temple," which has been specially designed for building into corners.



A new "Efesca" inset fire

The same company has also introduced an electric water circulator made to ensure a quick supply of water without interfering with the existing supply in the house. The elements are housed in separate chambers round the circulator and a special device is incorporated to prevent furring, comprising metal slides which can easily be removed and cleaned.

Immersion heaters, somewhat similar to the circulator but without the metal slides, are available, while there are electric storage heaters of both the pressure and non-pressure type, the former being made only in the cylindrical shape and the latter both rectangular and cylindrical.

A Radio Relay Receiver

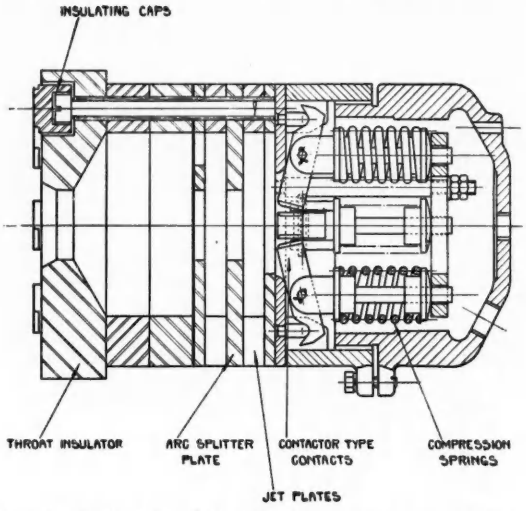
Distant and foreign stations do not often figure in the relay operator's programmes because they cannot be tuned in at sufficient strength and consistency of volume to make them really entertaining. These disadvantages are claimed to be overcome by a new receiver built by the GENERAL ELECTRIC Co., LTD., Magnet House, Kingsway, W.C.2, for multiple speaker relay requirements.

The receiver employs a 9-valve super heterodyne circuit with no fewer than seventeen tuned circuits. Four tuned circuits precede the first detector and the automatic volume control is so effective that an input variation of 40 db. is reduced to 3.5 db. in the output.

Good signal strength is ensured by a special sensitivity control incorporated in the circuit which automatically measures the volume of a station. If the station is not strong enough to provide good listening it is "rejected," but if its signal strength is sufficient, then it is "accepted." This control is adjustable and can be set so that the range of the receiver is brought down to 20 or 30 stations. A station providing a programme which can be relayed at full loudspeaker strength causes a green light to flash. This light remains on as long as the station is in tune. When the set is tuned in to a weak signal or where no programme is receivable, a red light gives an indication. The receiver covers all wavebands from 13 to 2,000 metres.

Self-compensating Arc Control

The arc-control device included in some 33-kV 1,500,000-kV.A switchgear of the single-break type, built by the BRITISH THOMSON-HOUSTON Co., LTD., Rugby, is a self-compensated explosion chamber. This differs from the ordinary explosion pot in having the side orifices arranged so that the first aperture is exposed immediately the contacts part. At high values of short circuit the rapidity of gas and pressure formation

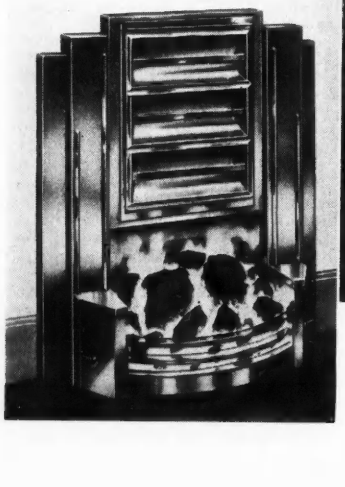


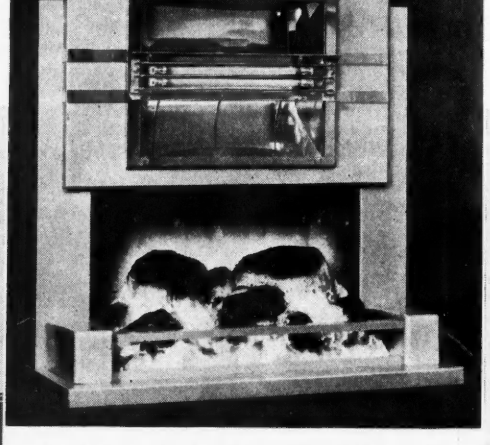
A sectional drawing of the B.T.H. switch arc-control device

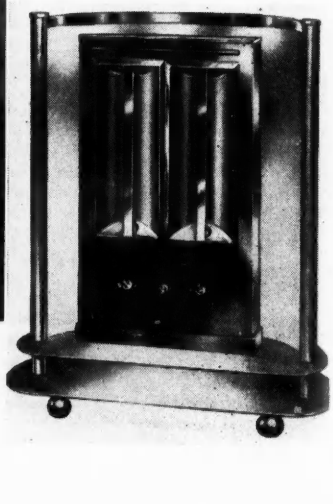
deionises the arc path, the insulation strength of which is established on the first or second current zero with only the first aperture uncovered. At intermediate values of short-circuit current a slightly longer arc is necessary to produce gas and pressure conditions favourable to insulation recovery, which occurs at the third and fourth current zero with the second aperture uncovered. At lower values the arc may extend to the beginning of the throat opening before the path can acquire the requisite insulation resistance to effect interruption, so that both the side orifices and the throat function at small current values.

A Refrigerated Counter Display Case

A development introduced by the LIGHTFOOT REFRIGERATION Co., LTD., Bush House, Strand, London, W.C.2, is a 10 cu. ft. refrigerated counter display case with glass sides. Three removable shelves give ample storage space and a model is available also in 6 cu. ft. size. A seven-point temperature selector is fitted to the "Westinghouse" hermetically sealed unit, and milk, cream, butter, meat, &c., can be displayed to advantage without risk of deterioration.







Already manufacturers are preparing plans for the autumn season electric fires. Here are three new models: The two outside ones are by Berry's Electric, Ltd., and the centre design by Ferranti, Ltd.; they are the "Kingsberry," "New Flamera" and "Aeroberry"

Electrical Manufacturing in China

At a recent joint meeting of the Chinese Centre of the Institution of Electrical Engineers and the Engineering Society of China in Shanghai an instructive paper on "The Manufacture of Electrical Equipment in China" was read by a Chinese electrical engineer, during the course of which he remarked that with the several increases in import tariffs during the last ten years or so and the growing industrialisation of the country there has been a very strong impetus to manufacturing activities in China with the result that in the electrical engineering field the variety of equipment now being manufactured in that country covers a wide range from such heavy plant as power transformers, alternators and motors to scientific instruments, lamps, switches and domestic appliances.

Although there are a number of works, either connected with railways or some other Government bureau, in Canton, Nanking, Tientsin and elsewhere engaged in the making and assembling of wireless sets, telephone switchboards, plating dynamos, &c., the bulk of the commercial activities centre round Shanghai, due to the ease of importation of raw and semi-finished materials and to the trading facilities existing in that city.

While there have been many Chinese financiers and pioneers in the establishment of cotton, flour, oil mills and other industries, it is noteworthy that, up to the last few years, hardly any industrial magnates have entered the field of manufacturing electrical equipment in China. With a few recent exceptions, most of the works have been started by some far-sighted mechanics and fitters and by the simple and most expeditious method of copying existing equipment. There are at present three large concerns in the Shanghai area manufacturing power transformers, with capacities as high as 2,000 kVA and voltages up to 33,000, and it is estimated that these concerns have turned out, during the last fifteen years, an aggregate of approximately 5,080 transformers, totalling 363,825 kVA. The steel sheets used for the core plates are imported mostly from the United States, England and Germany. Winding wires are chiefly supplied from America; insulators are of local make, but for h.v. work American, British and sometimes Italian goods are still imported.

Generators, Motors and Switchgear

With the present tendency towards centralised and larger generating plants, a very limited number of small alternators and d.c. dynamos are made, the largest so far constructed being of 200 kVA capacity. A number of small d.c. plating generators have, however, been manufactured. The first piece of commercial switchgear made was a copy of a well-known British oil switch. Since then this same switch has been imitated by many others, and switchgear in general has improved in quality gradually. Another line of manufacture which has been rather successful is a neon-sign transformer, which, it is stated, has almost entirely replaced the imported article.

Insulators for electric light fixtures and l.v. work have been made for some time, while h.v. insulators for transmission lines and also for radio transmission bushings have recently appeared on the market. There is a concern making h.v. insulators for transformers, and insulators for telephone and telegraph lines are also being manufactured in the Shanghai district.

Suitable clay and other raw materials are readily obtainable, and it is hoped that this industry will develop rapidly when the art is better understood and controlled. Already importation of electric glassware and reflectors has almost ceased, the market being catered for by local goods. No plant has so far been projected or established for the drawing of copper wire and cable manufacturing, although the matter has been under consideration for several years by one of the Government Commissions.

Coolie labour is being displaced by electric motors in many directions. There is a plant near Shanghai, specialising in a.c. motors, which although it has only been established about three years has sold nearly 3,000 machines in sizes up to 60 b.h.p. The plant is now being extended to manufacture machines up to 200 b.h.p.

Radio Apparatus

Considerable progress has also been made in the manufacture of radio equipment during the past fifteen years. This activity can be roughly divided into two classes, namely, firms which manufacture parts for amateurs and others which build transmission sets for broadcasting stations and Government communication stations, portable army sets, transmitting and receiving sets for aeroplanes, &c. Of the materials used, wires and steel sheets are invariably imported from America, as well as aluminium sheets for condensers, while brass rods and magnets come from Germany. One of the largest concerns even moulds its own bakelite parts. Radio valves appear to be the only article that must be imported, and it is understood that a commission has been sent to England by the National Government to study this problem with a view to establishing a valve-making factory in China.

Household Equipment

In the domestic appliance division the major activity is the electric lamp business. There are many factories making them, but the majority are of small size and produce very poor quality lamps. Apart from such plants there are only about three or four concerns manufacturing lamps which are equipped with up-to-date machines and testing apparatus. The necessary materials are, however, practically all imported from abroad.

There are about fifty plants and small shops making flash-lamp bulbs. Even in the more remote provinces flash lamps and dry cells have become a daily necessity, in place of the age-old candlestick. A conservative estimate places the daily output of the different works at about 500 cases, each containing 1,440 flash-lamp cells.

The production of lampholders, tumbler switches, plugs and sockets and other lighting fixtures was started many years ago, but there appears no particular improvement in quality, due partly to the use of poor raw material and efforts to cheapen the product. Other domestic appliances, such as electric irons, toasters, radiators, fans, are very plentiful and reasonable in price.

Electric fans are made by several concerns and there is very strong competition. The annual output of all the factories is about 100,000 fans, including both desk and ceiling types. There are also three works making enamelled and galvanised electric conduit and fittings. The method of production is, however, rather crude and slow, but the retail price is approximately only half that of the imported British quality.

Unsatisfactory Conditions

The general conditions of the average machine shop connected with the electrical industry in China leave much to be desired. With one or two exceptions, all the machine tools are crowded into one building which is usually badly lighted and ventilated. Nearly all the lathes, shapers, milling machines, planers, &c., are of German make, and mostly of light construction, and they consequently cannot undertake work of great accuracy. Also, there is an absence of tool rooms and the comparatively underpaid mechanics cannot afford to provide themselves with decent tools. In spite of this, good work is still produced, and there is no doubt that with improved equipment even better articles could be turned out.

Still another feature which calls for betterment is the necessity of adequate inspection. Generally speaking, the idea of inspection and elimination of defective goods appears to be regarded as wasteful, since it cuts down production. However, this necessity is now gradually becoming recognised as competition becomes daily keener and the importance of quality is stressed.

As to the personnel of the industry, one finds that there has been great improvement from the days when the No. 1 foreman used to hold sway. His place is now taken by keen, alert and young qualified engineers, all very anxious to do their best, the owners having come to realise that these young engineers are well worth their support. As for the workmen, efforts are being made to give them and their sons and daughters an education to raise them to a higher intellectual level. There is one concern making radio equipment which actually houses, feeds and trains all its apprentices in its works.

Summary of Factories

The following list gives a brief idea of the various activities connected with the manufacturing of electrical equipment in China :—

Branch.	No. of establishments.	Approx. no. of workers.
Transformers	3	400
Motors	4	350
Switchgear, industrial	4	250
Fans	10	500
Switches, plugs, sockets and general accessories	10	220
Radiators, irons, toasters, etc.	6	300
Glass and reflectors	5	100
Lamps	14	300
Flash-lamp dry cells and small lamp bulbs	51	2,000
Electric conduit	3	100
Insulators and other electric porcelain products	3	200
Neon signs and neon sign transformers	11	150
Static condensers	1	20
Radio material	9	400
Electrolytic copper refining	1	10

After a reference to the several large foreign establishments manufacturing electrical equipment in China, the author predicted that in the next five to ten years the importation of such electrical equipment as motors, switches, insulators, transformers and domestic appliances into China would drop considerably, if not cease altogether. In view of this several foreign concerns are already planning to establish works in China in the near future.

Chinese Electrical Imports

THE following table based on the official Chinese Customs returns for 1936 gives the values of the principal electrical exports in that year, with a note of the increases or decreases compared with 1935. The equivalent of the gold unit at the average exchange during 1936 was 2s. 8d. It will be seen that among an almost unbroken series of decreases Germany increased her trade here and there, notably in lamps and telephone material, while the only substantial progress made by the United Kingdom was in unspecified electrical fittings and materials. The continued decline in imports of some of the smaller materials suggests that local manufacture is permanently affecting import trade.

	1936. G.U. (000).	Inc. or dec. on 1935. G.U. (000).
Electric cables—		
Total	680	−272
From Germany	246	− 5
„ United Kingdom	205	−235
„ Japan	174	− 32
Insulated wire—		
Total	1,187	−187
From Germany	367	—
„ United Kingdom	43	− 14
„ Japan	582	−232
„ United States	98	+ 26
Insulators, fuse-boxes, plugs, switchboards, etc.—		
Total	164	−263
From United Kingdom	19	−135
„ Japan	86	− 74
„ Germany	40	− 34
Switches—		
Total	45	− 25
From Japan	16	− 4
Electric condensers and parts—		
Total	28	− 5
From United States	16	− 6
Other electrical fittings and materials, unspecified—		
Total	981	+275
From Germany	98	+ 6
„ United Kingdom	495	+259
„ Japan	232	+ 55
„ United States	126	− 50
Electric lamps and lampware—		
Total	661	+520
From Germany	450	+416
„ United Kingdom	6	− 11
„ United States	129	+ 94
„ Japan	33	− 2
France	32	+ 31

	1936. G.U. (000).	Inc. or dec. on 1935. G.U. (000).
Electric fans and accessories—		
Total	47	− 55
From United Kingdom	8	− 16
„ United States	14	− 17
„ Japan	17	− 17
Flashlights and torchcases—		
Total	48	+ 1
From Hong Kong	34	+ 12
„ United States	12	− 6
„ Japan	1	− 4
Radio sets and parts—		
Total	1,891	−305
From Germany	202	+ 30
„ United Kingdom	254	+ 8
„ Japan	291	−114
„ Holland	52	+ 21
„ United States	1,077	+ 97
Other telegraph and telephone instruments and materials—		
Total	1,141	−337
From Belgium	95	−207
„ Germany	624	+304
„ United Kingdom	149	+ 52
„ United States	103	−241
Electric lamps—		
Total	70	− 80
From Germany	8	− 5
„ Japan	36	− 13
„ Holland	5	− 1
„ United States	11	—
Accumulators and cells—		
Total	325	−185
From Germany	49	+ 14
„ United Kingdom	35	− 27
„ Hong Kong	26	− 6
„ Japan	31	− 2
„ United States	171	−142

	1936. G.U. (000).	Inc. or dec. on 1935. G.U. (000).
Electric meters and parts—		
Total	515	−353
From Germany	236	−267
„ Switzerland	73	− 23
„ United Kingdom	24	− 24
„ United States	85	− 38
Electrical appliances unspecified—		
Total	263	−252
From Germany	31	—
„ United Kingdom	8	− 11
„ Japan	20	− 14
„ United States	218	−215
Dynamos and generators—		
Total	190	−240
From Germany	108	+ 32
„ United Kingdom	36	−194
„ United States	14	− 28
Electric motors and parts—		
Total	788	−298
From Belgium	16	− 34
„ Germany	208	−127
„ United Kingdom	108	− 42
„ Japan	355	+130
„ Sweden	27	−103
„ United States	31	− 62
Transformers—		
Total	334	−128
From Germany	137	+ 7
„ United Kingdom	57	− 59
„ Japan	72	− 36
„ United States	47	+ 5
Electrical machinery, unspecified—		
Total	917	−278
From Germany	303	−274
„ United Kingdom	272	− 89
„ France	10	+ 1
„ Japan	174	+ 73
„ United States	72	− 36

Dutch Electrical Imports and Exports

ACCORDING to the Dutch official trade returns imports of electrical machinery and cognate material into Holland during the first six months of 1937 show an increase of £588,536 or over 48 per cent., as compared with the corresponding period of 1936, while exports have advanced by £1,455,222 (over 75 per cent.). For the purpose of comparison we have added the sterling value converting guilders at 9 to the £ to the totals given in the appended tables.

An analysis of the import figures shows that the principal supplying countries of the electric generators, in the order of their importance, were the United States, Germany, Switzerland, and Gt. Britain. Of the electric motors Germany is credited with 298 tons, followed by Belgium 196 tons, Gt. Britain 133 tons, Switzerland 57 tons, Sweden 42 tons, and the United States 39 tons. As regards radio sets and parts, Germany supplied 559 tons, Belgium 399 tons, Switzerland 168 tons, Czechoslovakia 131 tons, Gt. Britain 72 tons, the United States 59 tons, France 24 tons, and Austria 23 tons. The telegraph and telephone material came mainly from Germany with smaller lots from Gt. Britain, the United States, Belgium and Sweden.

Germany was easily first in the supply of vacuum cleaners, followed by Sweden, the United States and England. To Germany is attributed the bulk (3,139 tons) of the electric wires and cables, only very small quantities coming from Gt. Britain, Poland, Italy, Czechoslovakia and Switzerland. The chief sources of the imported electric lamps were Germany, Belgium, Hungary, the Argentine, Austria and Gt. Britain. Switzerland supplied about 75 per cent. (28,966) of the cycle lighting dynamos and Germany 14,959, while of the refrigerators 1,121 came from the United States, 401 from Sweden and 207 from Germany.

Unfortunately, the official returns are not so informative with regard to the export side, and it is remarkable that, while detailed information is given regarding the distribution of several relatively small items, no corresponding statistics are afforded in relation to the two items of radio material and electric lamps which form by far the major portion of the Dutch shipments. The Dutch East Indies took 97 tons of the Dutch electric generators and parts, followed by Germany 68 tons, Switzerland 21 tons, and Sweden 10 tons. Belgium and the Dutch East Indies were the largest buyers of the electric motors and Belgium of the vacuum cleaners. Gt. Britain was the largest customer (238 tons) for Dutch bulbs for electric lamps, Belgium being a very close second with 235 tons.

	IMPORTS. January to June.				EXPORTS. January to June.			
	1936.		1937.		1936.		1937.	
	Quantity.	Value in 1,000 Guilders.	Quantity.	Value in 1,000 Guilders.	Quantity.	Value in 1,000 Guilders.	Quantity.	Value in 1,000 Guilders.
Electrical generators and parts ... ... tons	261	315	325	480	99	91	220	198
Electric motors and parts ... ... „	513	504	834	962	407	375	557	570
Radio sets and parts ... ... „	1,240	3,315	1,519	4,374	2,206	11,063	4,563	21,447
Telegraph and telephone material ... ... „	1,183	1,680	1,615	2,384	28	97	27	163
Electric vacuum cleaners and parts ... ... „	209	449	182	455	37	65	57	106
Electrical measuring instruments ... ... „	1,938	2,722	3,206	4,768	693	2,098	958	1,695
Electric wires and cables ... ... „	4,282	1,137	3,722	1,609	2,357	688	3,605	1,656
Electric lamps over 16 v. ... ... No.	373,500	127	480,500	176	4,978,000	1,828	7,438,200	2,764
Electric lamps under 16 v. ... ... „	760,200	54	376,000	44	3,261,000	455	4,851,700	876
Other electric lamps ... ... „	—	11	—	15	—	141	—	396
Cycle lighting dynamos ... ... „	10,901	18	44,042	76	2,683	4	11,636	19
Cycle lighting dynamo parts ... ... „	—	15	—	29	—	2	—	4
Cycle electric lamps ... ... „	135,920	303	205,719	496	—	—	—	—
Bulbs for electric lamps ... ... tons	72	39	79	49	838	567	725	676
Electric and other refrigerating machines ... No.	1,598	171	1,749	240	14	2	13	3
Total Guilders	—	10,860	—	16,157	—	17,476	—	30,573
Total at 9 Guilders to £1	£1,206,667		£1,795,223		£1,941,778		£3,397,000	

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Tynedale Agricultural Society

The North-Eastern Electric Supply Company, Ltd., participated in the Tynedale Agricultural Show, which was the centenary show of the Society. Mr. H. D. Phelps, the company's agricultural engineer, and Mr. W. Laidler, junr., of Hexham, jointly devised a general display of electrically driven appliances and field implements required by the modern farmer. On this stand the advantages of employing electric motors for the operation of the haypole and for the driving of grinding and crushing mills, turnip cutters and potato graders and circular saws were amply demonstrated. A 4-cwt. electrically operated sack hoist was in evidence and three different kinds of electrically driven sheep shearing and clipping machines by the Wolseley Sheep Shearing Machine Co. were on view with a variety of pumps manufactured by James Beresford & Sons, Ltd. For the benefit of dairy farmers, a complete electric dairy was staged with a steriliser, water heater, bottle washer, milk cooler, separator and churn for an Alfa-Laval milking machine; there were also an electrically heated incubator and brooder, as well as a folding unit. The use of electricity in the home was demonstrated in a tent divided into three sections, in which were apparatus and appliances used in a modern kitchen, washhouse and sitting room. A Wilson electric delivery van was on show and available for demonstrations.

Electrical Goods for Canada

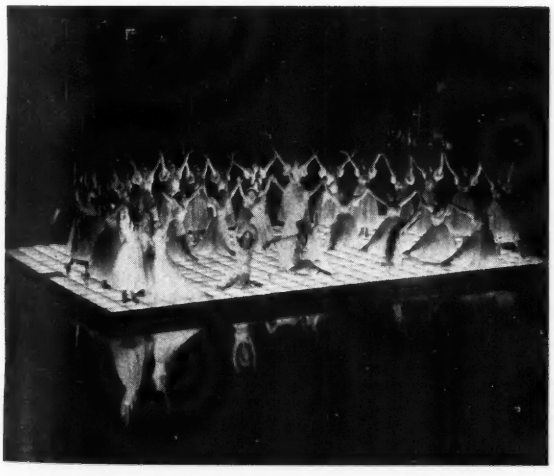
Specifications covering the construction and testing of the following articles have now been issued by the Canadian Engineering Standards Association, and copies are available on loan from the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1 (Ref. 16125/37):—Christmas tree and other decorative lighting outfits; receptacles, plugs and similar wiring devices; lampholders having socket screw-shells; and non-metallic flexible tubing.

Danish Radio and Lamp Manufacture

The branch factory at Copenhagen of the Philips concern has been extended in both the radio and lamp departments. The capacity of the output of wireless sets will now be about 120,000 yearly. Danish imports of radio material are now restricted mainly to valves and parts.

The Open Air Theatre, Scarborough

The accompanying illustration, which shows one of the scenes from this season's show, "A Pageant of Faust" at the Open Air Theatre, Scarborough, is of an illuminated floating glass raft and ballet from the Brocken scene. This raft was specially designed to give the greatest possible effect to the conception of ethereal ballet summoned by Mephistopheles during his



A scene from "The Pageant of Faust," at the Scarborough Open Air Theatre

tempting of Faust. It is 600 sq. ft. in area and is constructed with 15-in. squares of toughened glass on the floor, below which are 1,200 lamps and reflectors arranged in three circuits of cerise, green and amber. Each circuit is controlled by a dimmer, and the supply to the raft is given by long underwater trailing cables. A brilliant effect is obtained when the raft floats into the scene with the lighting gradually bringing out the forms of the dancers, until finally the dances are carried out in floods of changing colours from below. There are many other attractive lighting effects, and the total installed load is 210 kW. The whole of the lighting installation and effects was carried out by the Scarborough Corporation Electricity Department, under the supervision of Mr. W. K. Fleming, the borough electrical engineer and manager.

Electric-discharge Lighting in Industry

One of the most recent industrial installations of "Osira" high-pressure mercury-vapour discharge lamps is to be found at Smith Walker's steelworks at Bushey Road, North Acton. In the main shed, which is 400 ft. by 60 ft., a large amount of precision work has to be carried out. It was found that the quality of the light from "Osira" lamps, giving clear definition, with freedom from harsh shadows, not only improved the working conditions, but speeded up the output. The

A high and even lighting intensity is obtained at Smith Walker's steelworks, North Acton, by using "Osira" electric-discharge lamps

lighting is carried out by a central row of eight 400-W lamps in dispersive reflectors, supplemented by eleven 230-W lamps in parabolic angle reflectors along the side walls and five 250-W lamps in distributing type reflectors in a lean-to section. The average intensity in this main shed is 3 to 4 ft.-candles, at a saving of 50 per cent. in running costs. An extension shed, with no roof, is illuminated by two 400-W lamps, while the stock yard is effectively lighted with 250-W lamps in parabolic angle reflectors mounted on poles. Smith Walker's own engineering staff carried out the installation.

The need for adequate lighting has also been recognised by the Government in connection with the speeding up of the aircraft building programme. In this connection it is interesting to note that the Air Screw Co., Ltd., Weybridge, which manufactures many designs of aircraft propellers, has recently inaugurated a new scheme of illumination, also utilising "Osira" electric-discharge lamps.

Holidays with Pay

J. A. Crabtree & Co., Ltd., have decided to give works employés on clock and time check a full week's pay in respect of the annual holiday week. This concession took effect with the August holiday period this year and was applicable to all employés who had been in continuous service with the company for at least twelve months. In addition, all works employés of five years' continuous service will receive payment at ruling day rates for all national holidays and bank holidays. Upwards of 1,500 workers will benefit by these regulations.

Peruvian Electrical Imports

Imports of electrical apparatus into Peru during the March quarter of this year amounted in value to 2,478,000 soles, 372,000 soles less than in the corresponding period of 1936.

An Electric Wire Cartel

It is reported from Belgrade that the various electric wire and cable manufacturing concerns in Yugoslavia have formed a cartel, to operate until the end of 1939, under which orders for goods will be divided between the different producers.

United States Income-tax

The position in regard to the levying of income-tax on the profits of sales made in the United States by agents of United Kingdom firms has been materially altered by the United States Revenue Act, 1936, which effected a general revision of the taxes on non-resident aliens and foreign corporations. A foreign corporation (not an insurance company) trading or having offices in the United States is now taxable at a flat 22 per cent. rate on its income from sources within the U.S.A., while a foreign corporation not trading or having offices in the U.S.A. is liable to a 15 per cent. tax on its "fixed or

determinable annual or periodical" income from sources within the U.S.A., excluding capital gains. Dividends received from United States corporations are taxed at 10 per cent. A non-resident alien individual trading in the U.S.A. is taxable in the same way as a United States citizen, but in the case of short visits (not exceeding ninety days in the year) on behalf of a foreign firm "compensation" not exceeding $3,000 received for services performed is not to be taxed.

For Sale

The W. Midlands J.E.A. invites offers for the purchase of turbo-alternators and boiler plant.

The Abertillery U.D.C. has for sale electrical plant, copper wire, iron, &c.

Liverpool Electric Supply Department invites tenders for the purchase of generating and boiler plant.

Aylesbury Electricity Department has for sale one 250-cell, 480-Ah battery.

(See our classified advertisements.)

Trade Announcements

Super Enamels, Ltd., has purchased the assets of R. A. Lowrie & Co., Ltd.

Mayall & Co., Ltd., 61, Moor Street, Birmingham, 4, have been appointed the sole selling representatives of Archibald Low Electrics, Ltd., for the whole of the Midlands.

G. W. Franklin & Son, electrical contractors, have removed to 29, Fitzroy Square, W.1. The telephone number remains unchanged.

Transporting a Large Stator

A 90-ton stator for the Dalmarnock power station, Glasgow, started on the final stages of its journey from Newcastle on August 1st. The stator exceeds the ordinary limits for transport of machinery and had to be transported by the L.N.E.R. in three stages. The final stage was from Edinburgh to Glasgow. The stator is over 15 ft. long and 11 ft. high and wide and is loaded on rollers to allow it to be moved at certain points where extra clearance is needed for the passing of signal boxes. During its forty-miles journey from Edinburgh to Glasgow all traffic was suspended.

New Factory for Birmingham Company

Rowlands Electrical Accessories, Ltd., have just opened a new assembly works in Devonshire Street, Birmingham. The main production, including stamping, spring-pressing, welding, etc., will be continued at the old works at Hockley Hill,

The new assembly works of Rowlands Electrical Accessories, Ltd., in Devonshire Street, Birmingham

while the new premises will undertake the whole of the assembly work, in addition to enamelling and finishing. These new facilities will permit an increased output, as well as a speeding up of deliveries.

The Electrical Engineering Trade

According to the *Board of Trade Journal* the B.E.A.M.A. index of activity relating to the economic position of the electrical engineering trade for June was 173.1 per cent. of the 1930 figure, compared with 172.2 per cent. in May and 138.1 per cent. in June, 1936.

New Showrooms at Middleton

The new showrooms and offices of the Middleton Corporation Electricity Department were formally inaugurated on July 29th by the Mayor, Ald. T. J. Hilton. The new premises occupy a commanding position in the centre of the town and have a frontage of 62 ft., with display windows on each side of the entrance. The whole of the ground floor has been used for display purposes and in addition to a general showroom has a demonstration room where periodical cooking demonstrations will be given. The accommodation on the first floor comprises the electrical engineer's office, the offices of the staff, meter-reader's room, store and lavatories. The front elevation has been designed to give a marked horizontal effect. The shop front is recessed from the building line and illumination is provided from etched-glass laylights. Neon signs in red and green have been fixed to the front of the building. The heating of the building is provided by a low-pressure system, actuated by an electric thermal-storage installation utilising a supply at off-peak periods. All rooms are separately controlled with thermostats. The hot-water supply to the lavatory basins is provided by independent heating units encased in the pedestals. The lighting, with the exception of the specially designed rectangular ceiling fittings in the showroom, is by means of plain spherical fittings. Any special lighting effects required will be obtained with portable fittings. A synchronised system of clocks has been installed and the latest type of internal telephone equipment fitted in all offices. The building has been designed and constructed under the supervision of Mr. J. Pollard, the borough architect, the electrical installation being carried out under the direction of Mr. A. M. Mulliner, the borough electrical engineer. In 1924, when Mr. Mulliner became engineer, the number of consumers was 1,739 and the sales amounted to 7,140,000 kWh. To-day the number of consumers is 7,000, of which 1,000 are assisted wiring consumers, the number of kWh sold during the past year being 15,100,000.

The New York World's Fair

The first formal contract for exhibit space in a building to be constructed by the New York World's Fair, 1939, has been signed by the Westinghouse Electric and Manufacturing Co. The contract calls for 10,922 sq. ft. of floor space in the electrical production building. The space is a large part of the total exhibit area available in the building, which is to be erected at the south-east side of the Theme Plaza, the heart of the Fair grounds. Other prospective exhibitors are negotiating for the remainder of the space in the building.

Prices of Materials

Henry Gardner & Co., Ltd., report, August 4th: No change in the price of copper bars (best selected), sheet and rod. English piglead, £24 15s., 10s. dec. Spelter, £23 1s. 3d., 12s. 6d. inc. English block tin, £260 5s., £4 15s. dec.

Frederick Smith & Co., report, August 4th: Electrolytic copper bars, £65 15s., £1 5s. inc. Ditto, ditto, wire rods, £69 15s., £1 5s. inc. Ditto, ditto, h.c. wire, 10$\frac{1}{16}$d., $\frac{1}{8}$d. inc. Silicium bronze wire, 11$\frac{1}{4}$d., $\frac{1}{8}$d. inc.

Edward Till & Co., report, August 4th: No change in the price of India rubber, Para fine.

Indian Research in Electrical Manufacture

From the annual report of the Industrial Research Bureau of the Government of India, it is learnt that the Bureau carried out some research to assist electrical manufacture in the country. Investigations are in progress to obtain data to enable manufacturers of dry cells to produce high-quality cells able to comply with the best recognised specifications, and for this purpose complete information, not only as regards the composition of the components but also as regards the exact methods to be followed in the assembly of such cells is being acquired by experiments and tests. Assistance is also being rendered to the various electric lamp factories which have been established in certain provinces, by means of periodic tests of their products under closely controlled conditions and reports to the factories for their information. An interesting development arose out of a request for assistance from an electric lamp factory in Calcutta which was experiencing trouble with the cementing material in use for cementing the brass bayonet cap to the base of the glass bulb. The Research Bureau in co-operation with the factory devised a shellac cement which has proved quite satisfactory.

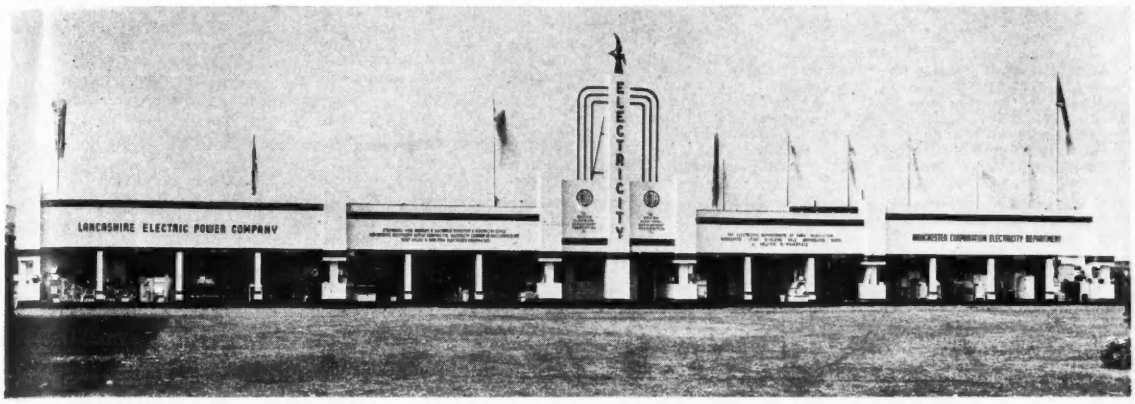
Drying Room Proposal Rejected

A novel proposal by the Hull Grammar School Committee to erect an electric drying room at the swimming bath has been rejected by the Board of Education. The scheme was evolved in consultation with the Hull Corporation Electricity Department. The Board, in a communication to the committee last week, stated that so far as it could ascertain the use of the proposed method for the drying of the whole body, as distinct from the hands only, would be an entirely novel procedure, and the Board had grave doubts whether it would prove satisfactory. It considered in particular that (1) In a room with an air temperature of 120 deg. F. the humidity would probably become so excessive as to be harmful; (2) the hot moving air might adversely affect the nasal mucous membrane and perhaps the eyes; (3) the rapid and fierce drying proposed might have an adverse effect on the skin of the body, which was not so resistant as that of the hands; (4) the boys, though they would probably be dry when they emerged, might begin to perspire profusely as soon as they put on their ordinary clothes, or sooner; and (5) the shower room and changing room might become undesirably hot. Therefore until the effects of the proposed methods could be decided by means of a full-sized experimental chamber the Board did not consider it reasonable that boys should be exposed to the possible risks. The chairman said that the Committee regretted the Board's decision, but would have to comply with it.

The Royal Lancashire Agricultural Show

This year's Royal Lancashire Agricultural Show was held at Hough End Fields, Withington, within the area of supply of the Manchester Corporation Electricity Department, the showground covering an area of forty-two acres. In the distribution of electricity to the stands of the 44 individual

exhibitors, with loads varying from 100 W to 17 kW, approximately 7,000 yd. of cab-tyre cable was used, together with thirty-two poles 20 ft. high. All the cooking and water heating requirements for the various catering sections of the show were met exclusively by electricity. The main kitchen was fitted with electric cooking equipment having a total connected load of approximately 200 kW and a maximum demand of approximately 150 kW. Apart from the main kitchen, many exhibitors were provided with facilities for tea-making, washing-up, &c., by means of electric wash-boilers and kettles, and all hot water requirements in the bars and cafeterias distributed over the ground were served from electric boilers. With the object of showing representative applications under working conditions, a joint electrical exhibit was arranged. The Manchester Electricity Department, in co-operation with the Lancashire Electric Power Co., the British Electrical Development Association and a number of local electricity supply authorities, set up an imposing stand. A tall central tower, faced with neon letters forming the word "Electricity" and topped with the familiar figure of the "I'm Electric" man attracted attention from every corner of the showground. The stand had sixteen bays, of which the two centre ones formed the exhibit and inquiry bureau for E.D.A. On the left seven bays were devoted to domestic appliances, dairy and poultry farming equipment and plant for electro-horticulture. On the right was, first, an exhibit representing an old-fashioned farm kitchen equipped with modern electrical appliances. Other bays on the right were devoted to hot water, electric room heating, household cleaning, food preservation by refrigeration, and cooking. On the stand there was a connected load of approximately 120 kW. A staff of firemen were on duty and their living quarters were provided with an electric cooker and wash-boiler. Similar appliances were also installed in the headquarters of the showground superintendent. The whole of the planning of the distribution of electricity on the showground, together with the labour and supply of material necessitated, was carried out by the Manchester Electricity Department. The heavy-duty electric cooking equipment and water-heating appliances were lent by the manufacturers and were augmented by smaller cookers and wash-boilers which were provided by the Manchester Corporation Electricity Department.



The combined electrical exhibit at the Royal Lancashire Agricultural Show

Reduction of Capital

The reduction of the capital of the Northern Rhodesia Power Corporation, Ltd., from £297,000 to £49,500, was confirmed by a High Court Order dated July 12th.

New Catalogues and Lists

Falk, Stadelmann & Co., Ltd., 83/93, Farringdon Road, London, E.C.1.—A card dealing with "Hitest" cables, flexibles and bell wires.

Broadway Engineering Co., Ltd., Carlisle Road, Hendon, N.W.9.—A catalogue of machine tools.

Runbaken Electrical Products, 280, Deansgate, Manchester.—Details of a new electric arc welder.

Gordon Equipments, Ltd., 25, Milton Street, London, E.C.2.—A leaflet describing handy bench grinders.

T. Broadbent & Sons, Ltd., Central Ironworks, Huddersfield.—A catalogue of clutches for electric motors to ensure easy starting.

Electricity for the Countrywoman

THE woman's view on the question of electricity in the farmhouse was expressed by Miss Caroline Haslett, director of the Electrical Association for Women, at the Association's conference held last Friday at the Royal Lancashire Show, Manchester. The E.A.W., said Miss Haslett, had a very definite conviction that the application of electricity for all possible purposes in the countryside could only lead to the amelioration of the lives of its women.

From the supply engineer's point of view there was a tremendous difference between supplying rural and urban areas. The capital expenditure involved in providing electricity to rural districts amounted to between £700 and £1,000 per sq. mile, and a return on this sum could only be obtained when the whole population was eager to consume electricity for all possible purposes. Twelve years ago electricity was being used by about 200 farmers in the country; last year the figure stood at 28,000. When electricity was brought to a village supply engineers first turned their attention to the area where the always sparse population was most highly concentrated, namely, the centre of the village, and secured the domestic load from the houses clustered together before attending to the more distant farms.

The electrical equipment required for a farmhouse was totally unlike what was desirable in a town house, but once a farmhouse had been suitably equipped home life in the country became as comfortable as home life in the town. As the kitchen was a workshop as well as the centre of the work of the house, and because it was often some distance from the dining-room, Miss Haslett thought it essential for the latter to have its own small breakfast cooker or griller, or, failing this, a hot-plate, warming plate or glass-enclosed trolley.

Constant hot water was a need of all homes and was best obtained electrically. A washing machine, too, was essential, and where poultry had to be dressed for market the presence of a refrigerator avoided a last-minute rush. For the rest she liked to see in a farmhouse all the other appliances devised for pleasure and comfort, such as artistic lighting, fires, fans, kettles, percolators and toasters. The farmhouse had one asset which made a tremendous difference when the question of equipment was under consideration, namely, the advantage of space.

It was not as a labour-saver that electricity made its chief contribution in a garden, but for assisting in the production of vegetables and flowers out of season. The practice of soil heating now justified itself economically and was used by a large number of market gardeners. The advantages of ordinary electric lamps in greenhouses for forcing purposes had been known for at least fifteen years, and since then experimental work with neon lighting had been carried out with the most remarkable results. The labour economy of greenhouse heating was obvious, and soil pasteurisers, too, were now available in various sizes. Among the small electrical devices useful to the gardener were the insecticide distributor and the electrically heated fumigator. The flood-lighting of flower beds was becoming more and more widespread.

Of the applications of electricity on the poultry farm the one most supremely successful was incubation, since electric heating could be so perfectly controlled and the atmosphere kept pure. On the modern poultry farm a chicken lived a completely all-electric life.

Electricity on a farm meant that farm workers had time for productive work and did not have to spend their days "working like horses" when a 5-h.p. motor would answer the purpose without tiring. Rural electrification was a question of co-operation between the agricultural and electrical industries, since, however efficient the electrical apparatus might be, the results depended on the skill of the gardener or farmer.

Bankruptcy Proceedings

A. H. Estall, trading at 20, Thackeray Street, Kensington, W.8, as Henry Estall, electrical contractor.—This debtor applied for his discharge on July 28th at Carey Street, W.C., before Mr. Registrar Kean. The Official Receiver reported that the receiving order was made on May 3rd last and that debtor failed with liabilities of £1,033, against assets which had realised £221 and there was an additional £50 expected to be collected. The trustee expected to be able to pay a dividend of 2s. in the £. The Official Receiver added that the debtor had been in business on his own since 1919 and attributed his failure to the loss on a contract for the erection of a school for a public body. He had also suffered through bad debts and ill-health. The Registrar granted the discharge subject to a suspension of one month.

L. H. Howard, 10, Woodlands Park, Girton, Cambridge, electrical engineer, late of Saffron Walden, Essex.—A deficiency of £648 was disclosed at the public examination held on July 28th at Cambridge. The debtor stated that he commenced trading on his own account as an electrical engineer at Saffron Walden in 1934 with a capital of £175. After a fire in 1936, which was not wholly covered by insurance, he endeavoured to carry on the business, but he was not successful. The examination was adjourned.

S. D. Bennett, 2, Burnt Ash Parade, Lee, London, electrical engineer.—The public examination herein was held at the Court House, Greenwich, recently. Debtor attributed his failure to decline of trade in the district and bad debts. The business was successful for about six months. Then, as a result of one of the largest shops in Lee Green closing down, debtor's trade declined. In March this year, when creditors were pressing, he consulted his solicitors, and subsequently a meeting of creditors was held. The meeting was adjourned to allow debtor to see if he could find a composition of 5s. in the £. A deed of assignment was prepared, but was not executed, and on advice debtor filed his petition. The examination was adjourned for closing.

H. Jeffree, radio dealer, 72 and 76, High Street, Thornton Heath, Surrey.—This receiving order was made on a creditor's petition, and the debtor has now lodged a statement of affairs showing gross liabilities of £1,917, of which £1,622 is expected to rank for dividend, with a deficiency of the same amount. He attributes his failure to heavy law costs and bad debts.

L. E. Corfield, electrical contractor, 83, High Street, Hadley.—Trustee, Mr. F. C. Ormrod, 22, Swan Hill, Shrewsbury, Official Receiver, released July 21st.

S. E. Staines, deceased (S. Staines & Son), electrical engineer, 480, High Road, Leyton.—Last day for receiving proofs for dividend August 14th. Trustee, Mr. C. B. Park, Carey Street, W.C.2, Official Receiver.

B. G. Wright (Wrights Electrical Co.), electrical engineer, 15, Hounsfield Road, Sheffield.—Last day for receiving proofs for dividend August 14th. Trustee, Mr. E. Smith, Queen's Buildings, Queen Street, Sheffield, Official Receiver.

E. Aveyard (Alpha Electric Co.), electrical engineer, 14, Arnold Avenue, Hyde.—First and final dividend of 1s. 11¾d. in the £, payable August 20th at the Official Receiver's office, Byrom Street, Manchester.

W. H. Hammond, radio and electrical engineer, 18, Church Street, Leamington Spa.—First and final dividend of 2s. 6d. in the £, payable August 10th at 9-11, High Street, Coventry.

Company Liquidations

Metropolitan Rediffusion Services, Ltd., and **Wembley Rediffusion Service, Ltd.**—Claims by August 11th to the liquidator, Mr. W. C. Thornton Cran, Bush House, Aldwych, London, W.C.2.

Featherstone Wholesale Radio-Elec, Ltd.—Meetings August 24th at the offices of Corfield & Cripwell, Balfour House, Finsbury Pavement, London, E.C.2, to receive an account of the winding-up by the liquidator, Mr. W. A. J. Osborne.

Electricity Supply

Lighting, Domestic, Power

Aberystwyth.—CHANGE-OVER.—The Town Council has adopted a recommendation of the Finance Committee in favour of the present system of supply being changed from d.c. to a.c. at an estimated cost of £64,100.

Barrhead (Renfrewshire).—ELECTRIC STREET LIGHTING.—Approval has been given to a scheme, estimated to cost £3,300, for the lighting by electricity of all the streets throughout the borough.

Barking.—LIGHTING A NEW ROAD.—On Thursday last week we witnessed the inauguration of the new London Road extension, Barking, the ceremony being performed by the Mayor, Alderman A. Graham. The lighting was carried out by Siemens Electric Lamps and Supplies, Ltd., to the instructions of Mr. W. E. Kidner, the borough electrical engineer, and is part of an extensive "Sieray" street-lighting contract comprising some 250 points. The London Road extension comprises 400-W "Sieray" type "H" mercury electric-discharge lamps in "Bi-way" lanterns, mounted on brackets fitted to the trolley-bus standards to give a mounting height to the centre of the light source of 25 ft. above the carriageway and a projection of 6 ft. from the centre of the pole, the control apparatus being housed in cast-iron boxes strapped to the standards. The spacing is approximately 120 ft., the resultant lighting conforming with B.S.S. Class "D."

Belgian Congo.—OUTPUT OF ELECTRICITY.—The report of the Société Générale des Force Hydro-electriques du Katanga (Sogefor) shows that the output of power during last year amounted to 146 million kWh, as compared with 142.6 million kWh in 1935-36. With the object of meeting the increasing demand a fourth 13,200-kVA, 6,600-V generating set is being installed at the power station and a second 20,000-kVA, 6,000/120,000-V transformer at the sub-station at Jadotville belonging to the Société Générale Africaine d'Electricité.

Electric-discharge lamps fitted to trolley-bus standards at Barking

Birkenhead.—ELECTRIC DRIVE PREFERRED.—The Mersey Docks and Harbour Board has decided to substitute electrically driven plant for the existing hydraulic plant at the Birkenhead grain warehouses.

Birmingham.—LOWER CHARGES.—The following reductions in the charges of the Electric Supply Department will take effect from the September quarterly meter readings: The higher charges at present in force in the Warwickshire area are to be reduced to those obtaining in the city area, thus establishing one common scale of charges throughout the whole area of supply. Furthermore, the basic rates for ordinary users for supplies from the extra-high-voltage system will be reduced by 0.025d. per kWh on all steps. There will be a reduction of ¼d. per kWh on the three lowest rates of the ordinary lighting scale, while the rate for shop-window lighting (after closing hours) will be reduced from 1¼d. to 1¼d. per kWh, and for advertising signs from 2d. to 1¾d. per kWh. The long-hour lighting rates are to remain as at present, but the minimum charge of £12 per annum for not more than twelve 60-W lamps and £1 per annum for every additional 60-W lamp are altered to a minimum charge of £10 per annum for not more than ten 75-W lamps and £1 per annum for every additional 75-W lamp. Two additional steps are being incorporated in the inclusive-lighting tariff for cinemas and theatres, which will now be: For the first 200 kWh each week, 2½d. per kWh; 200 to 400 kWh, 2d. per kWh; 400 to 1,000 kWh, 1½d. per kWh; 1,000 to 2,000 kWh, 1¼d. per kWh; and

all in excess of 2,000 kWh, 1d. per kWh. The rate for commercial cooking (including commercial water-heating) is being reduced from ¾d. to ½d. per kWh.

PROGRESS OF HIRE SCHEMES.—During the six months to June 30th hire agreements were completed for 1,915 cookers and 5,220 circulators, storage heaters and wash-boilers.

Brentwood.—SUPPLY EXTENSION.—The Brentwood District Electric Co., Ltd., has arranged the necessary wayleaves enabling the provision of a supply of electricity to South Weald.

Bristol.—CHEAPER ELECTRICITY.—The Electricity Committee has decided to reduce the charge for lighting by ¼d. to 3¼d. per kWh, subject to discount. This follows closely upon a reduction in this rate of ½d. per kWh. The two-part tariff fixed charge is also to be lowered from 12½ per cent. to 10 per cent. on rateable values up to £50, and the minimum payment of £2 2s. is being reduced to £1 10s. per annum. The running charges are ½d. per kWh for the two winter quarters and three kWh a penny for the two summer quarters. The reductions will take effect from the meter readings at the end of the current quarter.

Canada.—TORONTO.—The Toronto Hydro-electric System (general manager, Mr. E. M. Ashworth) last year sold 977.4 million kWh, an increase of 6 per cent. compared with 1935. The connected load at the end of the period was 1,151,105 h.p., against 1,119,629 h.p. a year before.

Cheltenham.—SUPPLY EXTENSION.—The Electricity Committee is to provide a supply to the Whaddon Farm housing estate at a cost of £2,352.

A Finnish electrical kitchen equipment exhibit at the Helsinki Fair

STREET-LIGHTING IMPROVEMENTS.—A sum of £2,049 is to be spent by the Electricity Committee on improving the street lighting.

Chester.—POWER POINTS IN CORPORATION HOUSES.—Authorisation has been given for the installation of power plugs in Corporation houses as required by the tenants.

Clitheroe.—SHOP LIGHTING.—An alternative two-part tariff for shop lighting has been introduced by the Electricity Committee, as follows: £10 per kW per annum, plus 1d. per kWh.

NEW EQUIPMENT.—Subject to loan sanction, a further duplicate 3,000-kVA regulating transformer is to be purchased by the Corporation.

Cotherstone (Yorks).—ELECTRIC LIGHTING.—The Parish Council has decided to adopt the Lighting and Watching Act of 1833 and has accepted the tender of the North-Eastern Electric Supply Co., Ltd., to erect twelve lamps at a cost of £190 in the main streets.

Coventry.—TWO-PART TARIFF CONCESSIONS.—Based upon the consumption during 1936-37, reductions in electricity charges authorised by the City Council at its meeting last week will involve a loss of revenue of £17,600. Under the domestic two-part tariff the running charge is to be ½d. throughout the year instead of ½d. in the summer and ¾d. in the winter. Supplies for the first hour per day (91 hours per quarter) under the m.d. tariff for the lighting of shops and business premises are to be charged at 6d. per kWh, for the second hour at 2d. and all in excess at ¾d., instead of the present 6d., 3d. and ¾d.

Dover.—CHANGE-OVER COMPLETED.—It is reported that the change-over has now been completed.

Dumfriesshire.—EXTENSION ORDER.—The application made by the County Council for an extension Order, known as the Dumfriesshire (Electricity) Extension Order, 1937, covering the parish of Castleton, in Roxburghshire, has now been approved and became effective as from July 26th. The Council is proceeding at once to extend its high-voltage mains to Newcastleton and to premises *en route*. It is hoped to have a supply available in this district before the winter.

Eastbourne.—MAINS.—The Electricity Committee has obtained sanction to borrow £6,458 for mains.

RURAL EXTENSIONS.—Sanction is being sought to a loan of £15,000 for extensions in the rural area.

Eccles.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £762 to provide a supply to the Winton Grange estate, where eighty-six houses are in course of erection.

Falkirk.—REDUCTIONS.—The Electricity Department has reduced its charges, and consumers will benefit by approximately £7,000 per annum. The already low domestic lighting and heating tariff is further modified. Instead of 13 kWh per room per survey (three a year) being charged at 2½d. per kWh, 12 are now charged at 2d., the minimum being 36 in place of 39 kWh, while additional consumption costs ¼d. instead of ½d. per kWh. For lighting (domestic consumers) the rate is reduced from 2½d. to 2d. per kWh. Concessions are also granted to large and small power consumers, hospitals, infirmaries and nursing homes, theatres, shops, &c.

Finchley.—ELECTRICITY FOR DOMESTIC PURPOSES.—The Electricity Committee has agreed to consider the installation of electric cookers and water heaters in houses on the Red Lion Hill estate.

RECTIFIER.—With a view to relieving the d.c. network a d.c. mercury-arc rectifier sub-station is to be installed on the premises of Simms Motor Units, Ltd., to deal with the whole of their power load.

Finland.—ELECTRIC COOKING PROGRESS.—The effect of tariffs on the use of electricity for cooking is borne out by experience in Finland. The first electric cooking equipment was installed at the Torni Hotel in 1930. By December, 1935, there were about 900 cookers in the country; in 1936 this number had increased to 2,450, and by July 1st this year there were over 3,000. The chief reason for this rise in the popularity of electric cooking was the introduction in 1932 of two-part tariffs. These, so far as domestic consumers are concerned, are based upon the kW connected, and for large consumers upon the maximum demand, a small running charge applying in each case.

Harrow.—TRANSFER OF UNDERTAKING.—By the North Metropolitan Electric Power Supply Act, 1937, the undertaking of the Harrow Electric Light & Power Co., Ltd., with certain adjustments, is transferred to the North Metropolitan Electric Power Supply Co. The Act also makes new provisions as to the rights of purchase of the Harrow Urban District Council.

Hastings.—EXTENSIONS.—The Electricity Committee is to provide a supply to the Pelsham estate, Peasmarsh, at a cost of £145. To afford a supply to the new Ritz cinema in Cambridge Road the Committee is extending its mains and erecting a sub-station, the cost being £1,504.

METERS.—Sanction is being sought by the Electricity Committee to borrow £5,550 for meters, and the Committee is to purchase approved apparatus for meter testing at a cost of £1,200.

Inverness.—NEW PLANT URGENTLY REQUIRED.—After an inquiry at Inverness some time ago the Electricity Commissioners refused to allow the Town Council to install additional plant, the alternative being to take a bulk supply from the Grampian Electricity Supply Co., a step which the Council does not favour. It is now feared that a serious situation may develop during the winter. The number of consumers has increased and in the past year the consumption of electricity has risen by 10 per cent. According to Mr. G. E. MacLean, engineer and manager, if one of the 100 kW sets breaks down it would be necessary to restrict supplies. What is needed, he states, is another 2,000 kW turbo-alternator set. It is anticipated that another effort will be made to induce the Electricity Commissioners to allow the installation of the plant.

Inverurie.—SUPPLY TO RAILWAY WORKSHOPS.—Electricity for the L.N.E.R. workshops at Inverurie will in future be given from Tummel by the Grampian Electricity Supply Co. In the past power was obtained from a steam-driven generating plant at Inverurie.

Leicester.—SWITCHGEAR.—Expenditure on new switchgear at the central generating station, amounting to £51,426, has been approved by the City Council.

Lowestoft.—NEW EQUIPMENT.—The Electricity Committee is to purchase switchgear protective equipment at an estimated cost of £200, two 300-kVA transformers for use at the Oulton Broad kiosks (£350), and automatic fire protection equipment for eleven sub-stations (£700).

NEW EQUIPMENT.—Sanction is being sought by the Electricity Committee to loans of £15,400 for meters and £5,520 for mains.

Luton.—SUB-STATION.—The Town Council is to erect a sub-station at Leighton Buzzard at an estimated cost of £3,807.

Manchester.—LIFTS.—The Buildings Committee is to install new service lifts at the Victoria Hotel at a cost of £1,050.

Newbury.—SUB-STATION.—The Urban Electric Supply Co., Ltd., has decided to erect a sub-station in Old Newtown Road.

Oxford.—NO SATURATION.—It is absurd to talk of saturation, states Mr. H. G. Fraser, city electrical engineer and manager at Oxford, whose undertaking last year sold nearly 27 million kWh, as compared with less than 7 million kWh in 1931-32. Owing to the small amount of new building works in the area only 811 new consumers were connected last year. Nevertheless, the installed load added was 8,801 kW, or 18 per cent. The two highest demands last winter were both at noon, pointing to the success of the Department's domestic campaign—an eight-day electrical exhibition held during the past year was visited by 31,219 people, exclusive of staff. The consumption of the colleges reached 2,234,000 kWh, which compares with 529,244 kWh five years ago. It is stated that the large electric travelling oven installed at the new factory of Oliver & Gurden has been highly satisfactory, the firm finding the results both technically and financially sound. The oven is loaded to 200 kW, and the equipment is the first of its kind to be installed in this country.

St. Albans.—SODIUM LIGHTING.—One of the largest sodium lighting installations in the Home Counties is nearing completion at St. Albans, Herts. The roads at present lighted are Victoria Street, Stanhope Road and Hatfield Road, radiating from the centre of the city, which is already lighted by centrally suspended mercury electric-discharge lamps. For two miles "Philora" 150-W sodium lamps are used, and then 100-W to the city boundary. The spacing in all cases is 150 ft., staggered, the mounting height being 25 ft. (width of roads 30/40 ft.), with 6 ft. projection brackets. The fittings are of the "Eleco Sunway" cut-off type in which the lamp is shrouded, dimpled mirror reflectors being used, and they have two novel features. First, a certain amount of light is "spilled" over the outside of the fitting to prevent the overhead "curtain" effect so often experienced with this type of fitting. In addition, there is a glass panel in the side of the fitting away from the traffic, thus increasing the amount of light in this direction. One hundred fittings are at present installed, and the Council has given instructions for a scheme to be prepared for the lighting of other main roads in the district. The "Sunway" fittings were manufactured by the Engineering & Lighting Equipment Co., Ltd., the installation being planned by Mr. F. T. Negus, city engineer, in conjunction with the North Metropolitan Electric Power Supply Co.

A section of the new sodium street lighting installation at St. Albans

Seaham Harbour.—CHEAPER ELECTRICITY.—The Urban District Council has decided to reduce its electricity charges by ½d. per kWh in the case of ordinary, slot meter, assisted-wiring and hire-purchase slot-meter consumers.

South Shields.—SUB-STATIONS.—A sub-station is to be erected in the North Marine Park in connection with the trolley-bus service, and application is being made for sanction to borrow £2,500 for the erection and equipment of a sub-station in Dean Road.

EQUIPMENT.—Sanction has been received by the Town Council to borrow £10,000 for meters and £1,000 in connection with additional expenditure for the rewinding of two 5,000-kVA transformers. Application is being made to the Electricity Commissioners for sanction to borrow £5,000 for mains.

Stoke-on-Trent.—REDUCED CHARGES.—The following reduced charges for electricity have been adopted by the Corporation:—Multi-part tariff, present fixed charge based on floor area in accordance with schedule to be reduced by a 10 per cent. discount; lighting by prepayment meter, reduction from 4½d. to 4d. per kWh; lighting by prepayment meter, assisted wiring scheme "B," reduction from 5¾d. to 5½d. per kWh; restricted hour supply, reduction from 2d. to 1¼d. per kWh; electric motive power, quantity discount to be allowed on quarterly accounts exceeding £8, at the rate of 1 per cent. for each £8 up to a total of £100 per quarter for any one premises supplied at rates in accordance with scale. For supplies to electric kilns the charge ranges from 0.5d. to 0.375d. per kWh, according to the load factor, and a discount of 5 per cent. is now allowed for prompt payment.

CHANGE-OVER.—With regard to the change-over of supply in a further section of the central Burslem area, sanction is being sought to a loan of £3,400, which is the estimated cost of the cables and control gear.

Tynemouth.—CHEAPER ELECTRICITY.—The Town Council has decided to reduce the electricity charges as follows:—Lighting flat rate, from 3¾d. to 3½d. per kWh; heating and cooking rate, 1d. per kWh for the first 190 kWh per quarter and the remainder at 0.7d. per kWh, instead of 200 kWh at 1d. and the rest at ¾d. The discount on these tariffs is being reduced from 7½ to 5 per cent. At present the residential tariff is 12s. per room per annum, plus 0.6d. per kWh during the summer and 0.7d. during the winter, with a 7½ per cent. discount. It is proposed that the fixed charge shall be the same with supply at ½d. a kWh, less 5 per cent. discount. The rate for houses under the rateable value scheme, where there is a fixed charge of 4½ per cent. of the rateable value, is also being reduced, while prepayment meter users will receive a reduction of ½d. per kWh. The cuts, which it is understood will benefit consumers to the extent of £2,000 per annum, will come into operation on October 1st.

Walton and Weybridge.—LOWER TARIFFS.—The Town Council last week authorised reductions in the tariffs of the electricity undertaking. The running charge under the combined domestic tariff is to be ½d. instead of ⅝d. per kWh and the lighting flat rate 4d. (4½d. at present) per kWh. Other concessions apply to shop lighting, commercial heating and power. The cost of the revisions amounts to £5,287.

Traction

Brighton.—AGREEMENT.—An agreement with the Brighton, Hove & District Omnibus Co., Ltd., for the co-operative working of the passenger transport of the town was approved by the Council last week by forty-four votes to three. Under this agreement, which is to operate for twenty-one years and thereafter continue indefinitely, subject to a year's notice by either party, the Council is to seek Parliamentary sanction to the replacement of its trams by trolley-buses or i.c. buses. An Advisory Committee is to be set up and the joint services are to come into operation on April 1st, 1939, if Parliamentary powers can be obtained next year. Volk's Railway, if taken over by the Council, is to be outside the agreement.

London.—UNDERGROUND CONTRACT.—The London Passenger Transport Board has placed the contract for the steelwork needed for the new Swiss Cottage tube station. Plans for this station have just been completed. It will be connected with the existing Metropolitan station at Swiss Cottage by a pedestrian subway across Finchley Road, the entrances to the station being at the corner of Avenue Road and Eton Avenue. There will be three escalators to the tube platforms. Three of the four miles of tube between Baker Street and Finchley Road have been built.

Newcastle-on-Tyne.—NEW ELECTRIC TRAIN.—Representatives of local authorities and L.N.E.R. officials were present when a new train ordered by the L.N.E.R. for the electrified route from Newcastle to Whitley Bay made its inaugural run on July 30th. The Lord Mayor of Newcastle (Alderman John Grantham) assisted in driving the train, which consists of four articulated two-coach units. On its first run the train made a complete run of the circuit from the Central Station, Newcastle, to Monkseaton *via* Backworth and back along the riverside route. Among the many L.N.E.R. officials was Mr. C. M. Jenkins, divisional general manager, who conducted the Lord Mayor and others on a tour of the train. The new train is part of a £365,000 scheme for introducing new rolling stock to speed up the service and increase passengers' comfort.

CONVERSION TO TROLLEY-BUSES.—Another three tram routes in the city area are to be converted by the City Council to trolley-bus operation at a cost of about £87,000. The routes are Osborne Road, Fenham Hall Drive, a section of the Wallsend-Pilgrim Street route and Westmorland Road, where tram track renewal which would cost £110,000 has become necessary. A fourth tram track is also to be abolished, but here motor buses will be used.

South Shields.—ELECTRICITY CHARGES FOR TRACTION.—The Town Council has amended the charges made to the Transport Department for electricity for the trolley-buses. In future the rates will be £4 15s. per kW plus 0.44d. per kWh for the town area and 0.6d. per kWh for the added area. It is understood that under the old rates the electricity undertaking was making a loss.

TROLLEY-BUSES.—The Town Council is to buy another six trolley-buses at £2,150 each.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdeen.—August 17th. County Council Education Committee. Electric wiring and heating engineering work at Meldrum Commercial Road school and new schoolhouse at Old Meldrum. G. Gray, architect, Inverurie.

Aldershot.—August 31st. Borough Council. Electric wiring at seventy-eight houses at Aldershot Park. (See this issue.)

Australia.—MELBOURNE.—August 17th. Posts and Telegraphs Department. Accumulator plates and separators. (T. 25450/37.)* Trunk telephone and telegraph cable. (T. 25307/37.)*
August 31st. Telephone accessories. (T. 18024/37.)*
October 12th. State Electricity Commission of Victoria. One 30,000-kW steam turbo-generator, complete with condensing and accessory plant. (July 23rd.) Switchgear, including compound-filled circuit-breakers, current transformers and accessories. (T. 25684/37.)*
BRISBANE.—September 20th. City Electric Light Co. Feeder panels. (T.Y. 25700/37.)*

Barrow-in-Furness.—August 23rd. Gas and Water Department. Two sets of electrically driven centrifugal pumps for an output of 2,750 gal. per min. against a head of 140 ft., together with transformers, rectifiers, switchgear, pipes, valves, &c. Engineer and manager, Gas and Water Department, Salthouse Gasworks (deposit £2 2s.).

Bingley.—August 11th. U.D.C. Electricity Department. Electrically propelled tower wagon; 120 400-W mercury-discharge lamps, refractor bowl type, vertical burning, with all necessary auxiliaries. (July 30th.)

Blackpool.—August 14th. Borough Council. Four vertical-spindle axial-flow pumps and one drainer pump, together with electric motors, starting gear and necessary accessories, for the Lennox Gate pumping station. Borough surveyor, Municipal Offices, Talbot Square (deposit £1 1s.).

Bridlington.—August 9th. Town Council. H.v. and l.v. substation equipment. (July 30th.)

Burnley.—August 16th. Corporation. Electrical wiring in connection with the extensions to the Municipal College. (See this issue.)

Cannock.—August 24th. U.D.C. Electric lighting installations in connection with 196 houses on sites at Cannock, Chadsmoor and Hednesford. W. C. Speedy, clerk of the Council, Council House.

Chelmsford.—August 23rd. Education Committee. Electric lighting and power installation at the Moulsham senior, junior and infants' schools, Princes Road. H. W. Allardyce, architect, Clock House Chambers, Barking (deposit £5).

Dundee.—August 9th. Free Libraries Committee. Electric lighting installation at branch library. City quantity surveyor, 21, City Square.

Durham.—August 11th. City Council. Electrical installations in seventy-two houses. Cordingley & McIntyre, The College (deposit £1 1s.).

East Grinstead.—August 25th. U.D.C. P.i., l.c. and armoured cables for the period ending August 31st, 1938.(See this issue.)

Egypt.—CAIRO.—August 31st. Ministry of Public Health. 420-kW generating set, consisting of a three-phase alternator direct coupled to a vertical-type Diesel motor, in connection with the first extension of the new power station at Assiout. (T. 25185/37.)*

Erith.—August 16th. U.D.C. Re-wiring of electric lighting installation and wiring for plug points at the Northumberland Heath Junior and Infants' School. (See this issue.)

Ilford.—August 27th. Electricity Department. One 500-kW rectifier equipment, comprising two 250-kW units for traction supply. (See this issue.)

India.—SIMLA.—August 28th. Stores Department. Electric lamps for the beacon and floodlighting installations at the civil aerodromes in India and Burma. (T. 25702/37.)*

Irish Free State.—SLIGO.—August 17th. Corporation. Wiring 136 houses at Abbeyquarter. Town clerk (deposit £2 2s.).

Kingston-upon-Thames.—August 30th. Corporation. P.i. cables. (July 30th.)

Leighton Buzzard.—August 19th. U.D.C. Vertical centrifugal borehole and booster pump (12,000 g.p.h. capacity), with electric motor, metering equipment, &c. Sands & Walker, consulting engineers, Milton Chambers, Nottingham (deposit £2 2s.).

London.—COMMISSIONERS OF WORKS.—August 24th. Generating plant, including back-pressure turbo-generators, switchgear, transformers, cables, &c. Room 65D, 3rd Floor, H.M. Office of Works, S.W.1 (deposit £1).
HACKNEY.—September 29th. Borough Council. Water-cooling tower. (See this issue.)
ISLINGTON.—September 8th. Borough Council. Electric wire, conduits and accessories; and installation of electric lighting in blocks of dwellings. (See this issue.)

Macclesfield.—August 18th. Corporation. Electric lighting in connection with the extensions to the Isolation Hospital, Moss Lane. (See this issue.)

Manchester.—August 20th. Waterworks Committee. Three electrically driven multi-stage centrifugal pumps, with automatic control and switchgear, pipes, valves, &c. Chief engineer, Waterworks Offices, Town Hall (deposit £1 1s.).
August 20th. Electricity Committee. H.p. steam valves. (See this issue.)
August 25th. L.p. valves, circulating water pumps and automatic equipment for controlling four boilers. (See this issue.)
August 27th. H.p. steam pipes and receiver. (See this issue.)

Middlesex.—September 6th. County Council. Cooking equipment at the Redhill County Hospital. (See this issue.)

New Zealand.—WELLINGTON.—August 31st. Post and Telegraph Department. Telephone cable. (T. 25593/37.)*
November 23rd. Public Works Department. 5,000-kVA transformers. (T.Y. 25997/37.)*
September 28th. 40-kW direct-coupled engine driven generating set and accessories. (T.Y. 25999/37.)*
CHRISTCHURCH.—September 9th. Electricity Department. 200-kVA transformers. (T. 18008/37.)*

Northern Ireland.—BELFAST.—August 20th. Electricity Committee. Pumping equipment, mixing tank and pipework at the Harbour power station. (See this issue.)

Plymouth.—August 21st. City Council. Conversion of various lifts from d.c. to a.c. (July 23rd.)

Portsmouth.—September 2nd. Electricity Undertaking. 33-kV switchgear at the generating station. (July 30th.)

Preston.—September 3rd. Corporation. Electrical wiring at the Preston Institution, Fulwood. (July 30th.)

Salford.—August 11th. City Council. Electrical installation in new wing being erected at the Museum and Art Gallery, Peel Park. City electrical engineer, Electricity Department, Frederick Road.

South Africa.—JOHANNESBURG.—August 21st. Electricity Department. Iron-cored oil-immersed current-limiting reactors and associated equipment. (T.Y. 25820/37.)* Automatic convertor equipment. T. 25819/37.)*
August 21st. Two 2,000-kW synchronous motor convertors and associated equipment for the President Street and Central substations. (T. 25821/1937.)*
CAPE TOWN.—August 25th. Electricity Supply Undertaking. Transformers. (T.Y. 25719/37.)*
September 15th. Electricity Department. Air-compressor plant, electric motors, starters, relays, &c. (T. 25787/1937.)*

Sunderland.—August 30th. Corporation. Cables, wire, meters and lamps for twelve months. (See this issue).

West Lancashire.—August 11th. R.D.C. Two automatic electrically operated sewage pumps, one set of electrically operated automatic screening plant and aeration unit equipment, for the Maghull sewerage scheme. H. B. Ward, consulting engineer, 26, North John Street, Liverpool, 2 (deposit £5 5s. in each case).

West Riding.—August 16th. Mental Hospital Board. Wiring in connection with the installation of electric lighting in the Admission Hospital and two convalescent villas at the Menston Mental Hospital, near Leeds. W. E. H. Burton, architect and engineer to the Board, Mental Hospital, Wakefield (deposit £2 2s. to the clerk of the Board, Victoria Chambers, Wood Street, Wakefield).

Whiston.—August 18th. R.D.C. Automatic electrically operated sewage pumping plant, one set of electrically operated automatic screening plant, three revolving sewage sprinklers, valves, pipework, &c., for the Halewood sewerage scheme. H. B. Ward, 26, North John Street, Liverpool, 2 (deposit £5 5s. in each case).

Workington.—August 21st. Corporation. One 200-kVA and one 100-kVA transformers. (See this issue.)

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Birstall (BATLEY).—Oakwell Joint Hospital Board. Accepted. Electrical work in connection with the erection of a Smallpox Hospital.—J. Terry.

Chelmsford.—Education Committee. Rewiring at the Trinity Road school:

	£		£
C. F. Williams. Recommended	157	County of London Electric Supply Co.	215
Baker & Sons	175	J. Gripper	255
Spiers Bros.	184	Ilford Electrical Co.	302
Christy Bros. & Co.	203	G.E.T. Installations Co.	540
Essex Electrical Installations	203		

Eccles.—Electricity Committee. Accepted. 5-panel metal-clad switchboard (£833).—Met.-Vick. Elecl. Co. 350-kVA 3-phase transformer (£293).—Hackbridge Electric Construction Co. 3-panel e.h.v. metal-clad switchboard (£483).—Ferguson, Pailin. 250-kVA 3-phase transformer (£225).—Electric Construction Co. Feeder panel (£448).—B.T.H. Switchboard (£167).—English Electric Co.

Hastings.—Electricity Committee. Recommended. Arc suppression coil (£812).—Met.-Vick. Elecl. Co.

Liverpool.—Electric Power and Lighting Committee. Accepted. Two years' supply of switchgear required for static sub-stations.—Standard Switchgear, Ltd.; J. G. Statter & Co.

London.—L.C.C.—Wiring and fittings for electric fire alarm system at St. Olave's Hospital, Rotherhithe:

	£		£
G. Tate & Co. Accepted	586	Pinching and Walton	655
S. Reed & Sons	615	W. H. Gaze & Sons	662
Archibald Meckhonik	629	Blackburn, Starling & Co.	672
W. J. Furse & Co. (London)	635	Read & Partners	675
Ellis and Ward	648	Francis Polden & Co.	697

Wiring and fittings for electric lighting, power sockets and

clock points in blocks F, G and T of the Southern (Upper) Hospital, Dartford:

	£		£
A. J. Hewens & Sons. Accepted	**955**	Francis Polden & Co.	1,073
T. Clarke & Co.	1,036	Davis Myer & Co.	1,085
Berkeley Electrical Engineering Co.	1,045	Holliday & Son (Electrical) ...	1,098
S. Reed & Sons	1,050	Carr Bros.	1,165
Ellis and Ward	1,055	Caine Pernot, Ltd.	1,503

Wiring and fittings for electric lighting in administration block, laundry, receiving wards, &c., at the St. Francis Hospital, Dulwich:

	£		£
Bective Electrical Co. Accepted	**605**	Berkeley Electrical Engineering Co.	905
W. Steward & Co.	715	Atozed (Kingston)	913
Carr Bros....	772	W. J. Furse & Co. (London) ...	920
Grant and Blake	799	Ellis and Ward	960
City Electrical Co.	839	Collins Electrical	1,045
Bower Engineering Works (Electrical and General)	890		

Wiring and fittings for rewiring the electric lighting and power installation in the nurses' home and operating theatre at the Paddington Hospital:

	£		£
G. E. Taylor & Co. Accepted ...	**1,474**	J. E. Swann & Co.	1,760
Springvale Electrical Co. ...	1,482	Collins Electrical	1,860
G. E. Thomas & Co.	1,554	Grant and Blake	1,943
Bell Bros. & Co. (London) ...	1,693	Buchanan and Curwen	1,983
Davis Myer & Co.	1,755		

Wiring and fittings for new main switchboard and main cables and rewiring blocks A and G, &c., at the St. Giles' Hospital, Camberwell:

	£		£
G. E. Taylor & Co. Accepted...	**3,292**	H. J. Cash & Co.	4,120
Pinching and Walton	3,780	Read & Partners	4,150
City Electrical Co.	3,824	Buchanan and Curwen	4,168
Alexander Hawkins & Sons ...	3,985	Archibald Meckhonik	4,180
Holliday & Son (Electrical) ...	4,019	T. Clarke & Co.	4,201
Berkeley Electl. Engg. Co. ...	4,057		

HAMMERSMITH.—Electricity Committee. Rewiring the electrical installation at the Passmore Edwards Library, Uxbridge Road:

	£		£
Twentyman & Co. Recommended	**169**	C. Bond	220
Wilkins Electrical Works... ...	199	J. B. O'Brien & Co.	241
W. T. Canning & Co.	200	E. M. Austin	272
S. Hellyar	210	A. Bantock & Co.	281
S. Goodchild	213	A. E. Mayhew & Co.	284
J. Webb	214		

Lowestoft.—Electricity Committee. Accepted. Switchgear (£650).—A. Reyrolle & Co.

Middlesex.—Health Committee. Electrical installations at Chase Farm Institution:

	£		£
Middlesex Electrical Co. Accepted	**1,073**	Central Electric Co.	1,143
Johnson and Tanner	1,092	G. A. Weston	1,143
E. Wight & Co.	1,113	Colston Electrical Co.	1,525
F. H. Wheeler & Co.	1,127	C. F. Williams	1,525

Equipment for Chase Farm Institution: Bed lifts:

	£		£
H. Breakell & Co.	2,248	Pickerings, Ltd.	3,059
Marryat & Scott, Ltd.	2,936	W. Wadsworth & Sons	3,172
Evans Lifts, Ltd. Recommended	**2,950**	Express Lift Co.	3,800

Refrigeration plant:

	£		£
York Shipley, Ltd.	640	J. & E. Hall, Ltd.	712
Lightfoot Refrigeration Co. Recommended	**640**	Haslam Foundry & Engineering Co.	730
Pulsometer Engineering Co. ...	655	U.D. Engineering Co.	901

Cooking apparatus:

	£		£
Brightside Foundry & Engineering Co.	3,187	**Benham & Sons, Ltd. Recommended**	**3,474**
Aveling-Barford, Ltd.	3,335	Jackson Electric Stove Co. ...	3,522

Lift installation at Hillingdon Hospital:

	£		£
Marryat and Scott Recommended	**2,039**	W. Wadsworth & Sons	2,302
H. Breakell & Co.	2,070	Evans Lifts, Ltd....	2,510
Pickerings, Ltd.	2,193	Express Lift Co.	2,554

Accepted. X-ray equipment for Hillingdon Hospital (£600).—Solus Electrical Co. Wiring for wireless installation at Middlesex County Hospital (£120).—Colston Electrical Co. Radio gramophone units, &c. (£69).—Messrs. Bayleys.

County Buildings Committee. Recommended. Automatic telephone exchange system at County Offices (£540 per annum).—Reliance Telephone Co.

Education Committee. Recommended. Electrical installation at Southville school, Feltham (£584).—Read & Partners.

Oldbury.—Housing Committee. Accepted. Electrical installation at Council houses (£320).—D. Gittins & Co.

Smethwick.—Education Committee. Recommended. Electrical installation at nursery school (£121).—Walker & Co.

Stoke-on-Trent.—Estates Committee. Accepted. Replacement of electric lighting fittings at King's Hall (£1,486).—Barnett & Soans.

Tynemouth.—Town Council. Accepted. Electric cable (£142).—B.I. Cables. Switchgear (£281).—A. Reyrolle & Co.

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

ASCO refrigerator.

STAR flasher.

Readers should enclose stamped addressed envelopes when making their inquiries.

Notes

Electrically Heated Blankets for Ambulances

When a person is suffering from shock of any kind it is important that he shall be kept warm, and to ensure this many ambulances are being fitted with electrically heated blankets. When the ambulance is in the garage the blanket is continually on the mains circuit, and as it is thermostatically controlled the blanket is maintained at a stipulated temperature at all times. When the car starts out the supply is disconnected and the blanket covered with a waterproof sheet which will maintain the temperature suitably for urban calls.

Heating an ambulance bed at Leyton

For long-distance calls a 12-V model loaded at 96 W can be supplied by the makers, Thermega, Ltd. (the mains model is rated at 140 W). This supplies enough heat to compensate for radiation losses and also warms the patient on the return journey.

A third method is to have a 12-V blanket continuously on circuit for the mains through a transformer, so that it can immediately be switched over to the car battery.

This new system is now employed by many London Corporations, having displaced the old method of warming the ambulance which meant stuffy air but a cold bed. The blanket measures 50 in. by 25 in.

Capturing the Children's Interest

With the object of educating the youthful mind in the safe use of electricity a 20-page brochure, entitled "The Electric Imps," has been prepared by Mrs. F. V. McKenzie, director of the Electrical Association for Women (Australia). Assisted by numerous illustrations the concise outline of the way in which electricity is brought into service in the home cannot fail to leave its impression and to assist in making the rising generation electrically minded.

German Engineers' Convention

The 39th annual convention of the Verband Deutscher Elektrotechniker E.V. is taking place from August 5th to 7th at Konigsberg, Prussia. There are five groups in which papers are being read simultaneously; group A deals with power station work and overhead lines, B with machines, transformers, switchgear, etc., C with electric heating, electric drives, including railways, D with control, regulation and measurement, and E with light current engineering. Visits to local places of interest are included and there is a special programme for ladies.

The Institute of Metals

The twenty-ninth annual autumn meeting of the Institute of Metals is to be held in Sheffield from September 6th to 9th. An attractive programme has been arranged.

Appointments Vacant

Assistant for the Mines Department Testing Station, Buxton.

Canvasser and cooking demonstrator for Kirkcudbright C.C.

General assistant (electricity accounts) for Brentford and Chiswick Borough Council.

Lecturer in the Electrical Engineering Department of Robert Gordon's Technical College, Aberdeen.

Chief clerk for Lichfield Electricity Department.

Accountancy assistants for the N.W. Midlands J.E.A.

Lady cookery demonstrator and saleswoman for Tynemouth.

Consumers' engineer and showroom manager for the Stafford Electricity Department.

Examiners in the w/t. and instrument sections, Air Ministry.

Sales assistant for the Mid-Lancashire Electric Supply Co.

(See our classified advertisements.)

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

The appointment of **Mr. G. A. Robertson,** deputy borough electrical engineer at Preston, as borough electrical engineer, was confirmed at a meeting of the Town Council held on July 29th. He succeeds Mr. D. Adams, who retires in October next, and he will receive a salary of £900 per annum, rising to £1,100 in two years. A son of the late Mr. J. A. Robertson, electrical consultant, who was responsible for the design and construction of the Ribble power station, Mr. Robertson served five years' apprenticeship with the Metropolitan-Vickers Electrical Co., Ltd., and with W. T. Glover & Co., Ltd., at Manchester, where he gained a varied and extensive practical training in electrical and mechanical engineering. At Manchester University (Faculty of Technology) he obtained both the Bachelor of Technical Science and Master of Technical Science degrees. He was awarded a post-graduate scholarship for research work, and afterwards presented a thesis on the subject of high-voltage technology. From 1930 to 1934 Mr. Robertson acted as chief technical assistant to his father in Manchester, in this capacity gaining a wide technical and commercial experience in all matters relating to electricity supply undertakings. He was appointed to his present position in 1934. Mr. Robertson is an associate member of the Institution of Electrical Engineers and of the Institution of Mechanical Engineers.

Mr. G. A. Robertson

Mr. J. H. G. McNaughton, who was for many years in the publicity department of Crompton Parkinson, Ltd., has joined the staff of Thorn Electrical Industries, Ltd.

Mr. C. A. Boothroyd, who has for many years represented C.A.V.-Bosch, Ltd., in the West of England, has been appointed resident manager for the West of England and the South Wales area, and has taken up his residence at 345, Bath Road, Bristol.

Henley Appointments.—In addition to the election of Dr. P. Dunsheath as a director of W. T. Henley's Telegraph Works Co., Ltd. (and Henley's Tyre & Rubber Co., Ltd.), the *Henley Telegraph* announces the following appointments:—Mr. F. W. M. Anderson, assistant general manager; Mr. G. E. Rhodes, chief assistant to the management; Mr. J. S. A. Bunting, sales manager; Mr. E. J. Vidler, an assistant sales manager; Mr. R. F. Gyngell, assistant secretary; Mr. C. Grover, chief technical assistant, Contract Department; and Mr. A. V. Burnett, chief commercial assistant, Contract Department.

Mr. A. J. Davies

Mr. A. J. Davies has been appointed manager to the South Wales Depôt of Ensign Lamps, Ltd., in succession to Mr. D. G. C. Murphy. Mr. Davies, who was formerly attached to this depôt, has been engaged for the past twelve months in representing the interests of the company in the South of England.

Mr. W. Haynes (secretary), **Mr. O. Wans** (chief engineer), and **Mr. T. P. N. Burness** (general works manager) have been elected to seats on the board of Ruston & Hornsby, Ltd. Mr. Haynes commenced his business life at an early age at Spittlegate Ironworks, Grantham. He became private secretary to the late Henry Batty at Hornsby's, Grantham, whom he succeeded in 1905 as secretary upon Mr. Batty's election to a seat on the board of that company. When the Lincoln and Grantham Companies amalgamated in 1918 Mr. Haynes carried out the duties of liquidator of Hornsby's, and at the same time was appointed secretary to Ruston & Hornsby, Ltd. Mr. Wans was educated at Banff Academy, Dulwich College and King's College, London. He received his early training with Bryan, Donkin & Co., Ltd., London, and after gaining general and marine experience, including a period in India, he joined Ruston, Proctor & Co., Ltd., in 1910. He became technical manager in 1922 and chief engineer in 1930. He is a member of the three leading engineering institutions. Mr. Burness, after serving an apprenticeship, had three years' sea service as a marine engineer and was later with a firm of textile engineers. He joined Ruston & Hornsby, Ltd., in 1916, and during the last twenty-one years has occupied various managerial positions until 1936, when he was appointed general works manager.

Mr. E. R. Canning, chairman and managing director of W. Canning & Co., Ltd., and for some years a prominent figure in the public, political and religious life of Birmingham, has been unanimously elected the city's next Lord Mayor. A native of Binton, Warwickshire, Mr. Canning is sixty-one years of age, and his association with Birmingham dates back half a century. Entering the business of W. Canning & Co., Ltd., he was taken into partnership in 1902 by his elder brother, Mr. T. R. Canning, on whose retirement in 1918 he became sole proprietor. Two years later the business was converted into a limited liability company, with himself as chairman and managing director. Under various owners this business has been in existence nearly 150 years, and half a century ago the company was one of the pioneers of nickel plating. Since the introduction of chromium plating the company has made remarkable progress, particularly during the last fifteen years.

Mr. E. R. Canning

Loughborough Town Council has approved an increase in the salary of the borough electrical engineer, **Mr. J. P. Tucker,** of £100 immediately with three further annual increments of £50 each. The Gas and Electricity Committee had recommended this step so that it could reasonably ensure the continuation of his services for some time.

Mr. L. E. Smith, manager of C. A. Parsons & Co.'s pneumatic tool and air-compressor department, has been appointed personal assistant to Mr. F. G. H. Bedford, the company's managing director.

Mr. G. Balfour, M.P., deputy chairman of the London Power Co., has been elected chairman in place of the late Sir Francis Fladgate, and **Mr. O. R. H. Bury** has been elected deputy chairman.

The Earl of Lytton has been appointed chairman of London Associated Electricity Undertakings, Ltd.

Mr. J. Welch, B.Sc., A.M.I.E.E., has resigned his position as representative for Ferranti, Ltd., in Scotland and Northern Ireland in order to take up the position of meter examiner on the staff of the Electricity Commissioners. Mr. Welch has been with Ferranti, Ltd., for over eleven years. His new headquarters will be at 2A, George Square, Glasgow.

Obituary

Mr. W. R. Bullimore.—The death occurred on July 27th of Mr. W. R. Bullimore, managing director of A. C. Cossor, Ltd. Born in Australia fifty years ago, Mr. Bullimore came to London as a boy on the death of his father, a Whitworth scholar who had been sent to lay the first tramways for the city of Adelaide. On leaving technical college thirty years ago he joined the X-ray tube manufacturing concern of A. C. Cossor, Ltd., and soon afterwards acquired the controlling interest. After early work on X-ray and cathode-ray tubes and surgical lamps it was a logical step to the manufacture of wireless valves, and Mr. Bullimore was the inventor of the first Cossor valves put on the market, his hooded anode and arched filament patents making a revolutionary advance in radio technique. He was also

The late Mr. W. R. Bullimore

responsible for the idea of the constructor's kit of parts known as the "Melody Maker," which did much to popularise radio. He took a deep interest in the welfare of his workers, and one of his last acts was to put into operation a pension scheme. Mr. Bullimore leaves a widow and a son aged fourteen.

Mr. R. Innes.—The death occurred on July 23rd, in the Western Infirmary, Glasgow, of Mr. Robert Innes, who had represented Philips Lamps, Ltd., in the West of Scotland since 1927.

Herr Werner von Siemens, grandson of the founder of Siemens and Halske, and a member of its board of directors, died in Berlin on July 28th at the age of fifty-two.—*Reuter.*

Will.—Mr. R. Roper, resident engineer at the Upper Boat power station of the South Wales Electric Power Co. and chairman of the South Wales and Monmouthshire Joint Board (Electricity Supply Industry), left £7,382, with net personalty £6,513.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Claude E. Barkham, Ltd.—Private company. Registered July 30th. Capital, £500. Objects: To carry on the business of radio, television and electrical engineers and contractors, &c. The directors are: C. E. Barkham (permanent chairman and managing director), 127, Cricklade Road, Swindon, and four others. Secretary: F. R. Porter. Registered office: 127, Cricklade Road, Gorse Hill, Swindon.

Liverpool Electrical Supplies, Ltd.—Private company. Registered July 30th. Capital, £100. Objects: To carry on the business of manufacturers of, dealers in and agents and factors for the sale and purchase (on commission or otherwise) and repairers and hirers of electrical and mechanical apparatus and accessories and components of all kinds, and in particular wireless sets and valves, and gramophones, electrical engineers and contractors, &c. The directors are: A. George, 37, Botany Lane, Ashton-under-Lyne (director of Northern Electrical Distribution, Ltd., and two others). Registered office: 6, Stanley Street, Liverpool.

Celtic Electrical Products, Ltd.—Private company. Registered July 26th. Capital, £5,000. Objects: To acquire the business of makers of electric storage batteries and other electrical equipment now carried on by the Jubilee Battery Syndicate at Cardiff. The permanent directors are: L. E. L. Downing, Downing House, West Bute Street, Cardiff, and W. J. Pallot, 128-9, Bute Street, Cardiff. Registered office: Downing House, West Bute Street, Cardiff.

Illumination Equipment, Co., Ltd.—Private company. Registered July 24th. Capital, £500 in 500 shares of £1 each. Objects: To acquire the business of an electrical lamp distributor and salesman carried on by T. E. Jones. The directors are: J. E. Gisborne, 26, Leith Mansions, W.9; and T. E. Jones, 52, Leinster Gardens, W.2 (managing director). Solicitor: R. J. Cassels, Thames House, Millbank, S.W.1.

S. Richardson (Radio), Ltd.—Private company. Registered July 17th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in radio and television instruments, sets, components, &c., and to acquire the business of a radio dealer carried on by S. Richardson at 12, Market Place, Ashbourne. The directors are: S. Richardson, The Hall, Cokayne Avenue, Ashbourne (permanent governing director), A. Richardson, "Fairdene," Belper Road, Ashbourne, and F. A. Johnson, The Hall, Cokayne Avenue, Ashbourne. Secretary: Margaret Richardson. Registered office: 12, Market Place, Ashbourne.

Returns of Electrical Companies

Rangoon Electric Tramway & Supply Co., Ltd.—Satisfaction in full on June 30th of trust deed dated November 13th, 1913, and registered December 3rd, 1913, securing £200,000 5 per cent. mortgage debenture stock. Particulars filed of debentures to secure £200,000, and premium of 2½ per cent., authorised April 28th, 1937, and covered by trust deed dated June 2nd, 1937, charged on lands and buildings in Rangoon, and the company's undertaking and other assets, including uncalled capital, the whole amount being now issued. Trustees: Chartered Bank of India, Australia and China.

R. Darbyshire, Ltd.—Equitable charge on hire-purchase agreements, the full benefit thereof, all securities therefor, and all moneys payable thereunder, dated July 16th, 1937, to secure all moneys due or to become due from the company to Martins Bank, Ltd., not exceeding £1,000.

Bylock Electric, Ltd.—Satisfaction to the extent of £500 on June 12th, of debentures authorised January 9th, 1936, and registered January 13th, 1936.

Philip S. Schulman, Ltd.—First mortgage debenture, charged on freehold, leasehold and other property, including uncalled capital, and fixed plant and machinery, dated July 19th, 1937, to secure all moneys due or to become due from the company to Martins Bank, Ltd.

M. W. Woods, Ltd.—Charge on land in Colchester, dated July 2nd, to secure £2,760. Holders: Borough of Colchester.

Erdington Electrical Co., Ltd.—Capital, £2,000 in £1 shares. Return dated February 26th, 1936 (filed May 18th, 1937). 1,000 shares taken up. £1,000 paid. Mortgages and charges nil.

Trippe Lights, Ltd.—Satisfaction in full on June 30th, 1937, of debenture registered April 13th, 1933, securing £1,950.

Switchgear & Equipment, Ltd.—The nominal capital has been increased by the addition of £2,500, in £1 ordinary shares, beyond the registered capital of £10,000.

Veritys, Ltd.—Satisfaction in full on or before June 30th, 1937, of trust deed dated October 31st, 1908, securing £60,000 debenture stock and two trust deeds supplemental thereto dated May 17th, 1909, and February 20th, 1928, and registered November 20th, 1908, June 7th, 1909, and March 3rd, 1928, respectively, £60,000 debentures authorised by resolutions of April 13th and 21st, 1931, and registered April 28th, 1936, and further issues of £2,700 debentures registered June 13th, July 9th, and August 19th, 1931, respectively, and £10,000 2nd debentures (series "B") registered July 28th, 1936.

MacWhirter, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated July 22nd, 1937, to secure £7,000. Holder: A. C. MacWhirter, 16, Cyncoed Road, Cardiff.

Leslie Neaverson, Ltd.—Particulars filed of debentures for not more than £875, authorised July 3rd, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £875.

Ruthurstat, Ltd.—Particulars filed of £750 debentures authorised July 6th, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Sign Construction Co., Ltd.—Charge dated July 10th to secure all moneys due or to become due from the company to Barclays Bank Ltd., or moneys payable to the company by Earls Court Ltd., under agreement dated June 14th, 1937.

L. Adams, Ltd.—Satisfaction on July 16th, of debenture dated June 11th, 1925, and registered June 12th, 1925.

M. & W. (Radio & Electrical), Ltd.—Satisfaction to the extent of £1,550 on April 14th, 1937, of debentures authorised October 27th, 1936, and registered November 16th, 1936. Notice filed July 21st, 1937. (According to the register of mortgages, the debentures registered November 16th, 1936, originally secured £20,500.)

City Notes

The Young Accumulator (1929), Ltd.—Presiding at the annual general meeting of the company on July 29th Lt.-Col. L. P. Winby, chairman, said that the profits had been adversely affected by the unpredictable and abnormal increase during the latter half of the year under review in the price of lead and lead oxides which formed the basis of the company's products. The rapid rise from £15 to £36 per ton was, in the view of the industry, due to speculation and was quite unjustified by the world's supply and the demand of legitimate trade users. It was not practicable to adjust immediately the selling prices of batteries to meet such an unexpected increase. However, sales for the first three months of the year were much higher than for the corresponding period of last year, even when taking into account the higher selling prices. In view of the marked acceleration in the development of electric traction in recent years the directors had acquired an important holding in that class of business. The company had already an assured turnover of batteries under three contracts from one source alone of some £20,000, apart from which there were important contracts in hand for heavy electric vehicle batteries. An electric railway contract had been secured running into five figures, while orders for batteries for marine work showed a marked improvement. Starter and lighting batteries for motor cars, however, still continued to be the company's staple trade. Young batteries were used by the leading air transport company, while research led the board to believe that the company might develop the manufacture of larger batteries than hitherto. While there were unforeseen and uncontrollable factors, the chairman felt that they could look forward to a record year both for volume of trade and the measure of profit to be derived from it.

The Anglo-Argentine Tramways Co., Ltd.—In spite of the somewhat depressing report laid before shareholders there is a much more hopeful outlook for the company than for many years past owing to the enactment of the Law for Co-ordination of Passenger Traffic in Buenos Aires. This was stated by the Duke of Atholl at the company's annual general meeting held on July 29th. The year 1936, he said, was the second in succession in which the company had had to carry on its business at a substantial loss (that was, in Buenos Aires). This loss meant that for the last two years they had carried half the population of Buenos Aires at less than cost. With the Argentine currency depreciated by some 30 per cent. and under the present conditions of competition, &c., it was virtually impossible to carry enough additional passengers to be sure of covering operating expenses alone. Actually, the number of pasengers rose nearly 6,000,000 over the previous year's total, which itself was about 8,000,000 greater than the total for 1934, when the policy of a general speeding up and increasing services to prevent competition making further inroads into receipts began to produce results. The company had looked to the co-ordination plan for many years, not only for salvation, but for restoration to a reasonable level of financial stability. They were, therefore, justified in feeling satisfaction when the law was passed last September, though its full effects on the company could not yet be known.

Christy Bros. & Co., Ltd.—The gross turnover last year (£338,905) was higher than in any previous year. Mr. Frank Christy, chairman of the company, reported this at the annual general meeting on July 28th and added that there had been a general increase in all departments of the company's contracting work. The largest single contract was the third section of the West Devon hydro-electric scheme on the River Tavy, bringing the installed capacity up to 3,200 kW, the largest in England. The company's subsidiary had now turned the corner and was earning a net profit, the number of connections continuing to grow satisfactorily. Associated electricity supply undertakings had all shown substantial growth, the North Somerset Co. having increased its sales of electricity from 23½ to 28 million kWh and paid a 7 per cent. dividend; the West Devon Co. had increased its electricity generated from 3½ to 4¾ million kWh; and the undertaking at Aldeburgh-on-Sea was expanding satisfactorily. In regard to the Government proposals for the reorganisation of the distribution of electricity, these, if carried out, would cause great dislocation, while the advantages to be obtained by the suggested regrouping were very problematical. As a result of the numerous representations now being made it was hoped that a Bill would be drawn up on much more equitable lines than were indicated in the Government's outline.

The Jerusalem Electric & Public Service Corporation, Ltd.—Presiding at the annual meeting held on July 28th Mr. W. Shearer (chairman) said that the trouble in Palestine had naturally affected their revenue. The number of consumers connected had, however, again increased and in March last there were 13,234, a rise of 2,185 as compared with the previous year. In the current year the number of connections had risen by a further 1,000. A new 2,000-kW generating unit ordered last year was now in operation and should have an appreciable effect in reducing the working costs. Last winter the maximum demand exceeded 2,500 kW and it had been decided to install another large unit which, it was hoped, would be in operation before the end of 1937. The ring main had been operating satisfactorily for some months and extensions had been made to several surrounding districts, including Motza and Kirieth-Anavim. The total mileage of cables and transmission lines to date was 102. Street lighting supply had advanced, and there were now 1,065 public lamps connected. Reductions in rates came into force on December 1st, and judging from returns to date they should more than recoup the differences by increased business, particularly on the two-part tariff. With regard to the industrial load some 574 h.p. of additional motors had been connected in the past year.

The Nigerian Electricity Supply Corporation, Ltd., last year generated 26,203,450 kWh, an increase of over 49 per cent. as compared with the previous year. At the ordinary general meeting held on July 28th Mr. E. A. Seaborn Marks, chairman and managing director, stated that all the power generated by the company's two power houses was being sold, and to meet pressing demands for increased supplies they had decided to construct a third power station below the Jekko Falls. This new station, which would have a capacity of 4,500 h.p., would require no new water conservation but would use the outflow from the Kurra plant situated about five miles above it. The cost would be about £100,000, and although the company had £80,000 of unissued debentures it was possible that a more economical means of raising the necessary funds might be found. He suggested that an alteration of the constitution of the company providing for all shares to rank alike might prove advantageous, since it would allow a much higher return on the capital invested. It was a matter of great satisfaction to the directors, after so many years of disappointment, that they were at last beginning to realise their original expectations. The trend of trade led him to believe that they could look forward with confidence to the future.

Thomas Bolton & Sons, Ltd., held their annual meeting on Friday last, when Mr. G. H. Nisbett (chairman), who presided, after referring to the death of Mr. T. Bolton, the late chairman, reviewed the accounts and commented on the sums spent on additional plant and buildings needed to meet increasing demands as well as to widen their range of products. He said that they still had in hand a large volume of uncompleted work on capital account and were in need of additional money on a permanent basis. Details of a capital issue were under consideration and an announcement on the subject would be made shortly. The improvement in profit was accounted for mainly by an increased turnover, but also in no small degree by substantial economies effected by the rearrangement of plant and processes. Indications at the moment pointed to a continuance of improved results; the whole of their existing machinery was fully employed and they were already in a better position to meet the requirements of their customers than at any other time in their history.

Thorn Electrical Industries, Ltd.—Presiding at the annual general meeting held on July 28th Mr. Jules Thorn, chairman and managing director, declared that the business of the company had made satisfactory progress in the past year and this progress had continued in the current year. They were taking the greatest care in the production of "Atlas" lamps, the quality of which had secured a number of contracts from municipalities, leading industrial users and others. The increasing demand for the lamps had made it necessary to erect a new building adjacent to the present factory, in which the latest automatic machinery would be installed. In the radio branch of the company's activities it acted as sole distributor for Ferguson radio receivers, which in two years had become recognised as of high quality among all-wave receivers marketed at competition prices. A new range of all-wave receivers would be released in August. They were looking forward to increased turnover during the current year.

Companies Struck Off the Register.—The following companies were struck off the Register on July 27th :—Beaver Radio (Manchester), Ltd.; British Radio Mfg. Co. (Liverpool), Ltd.; Domestic and Commercial Electricity (Hull), Ltd.; Electric Gramophone, Ltd.; Electrodes, Ltd.; Electromech Power Transmission Co., Ltd.; Electro Vendors, Ltd.; Express Electrical (Hampton), Ltd.; F. E. Godfrey (Radio), Ltd.; Lancashire Relay Broadcast Co., Ltd.; Micalite Tube Lamps, Ltd.; Modern Radio (Leeds), Ltd.; Rational Electrical Vehicles, Ltd.; Sebat Electrical Co., Ltd.; Service Radio Supply Co., Ltd.; Welburn Neon Signs, Ltd.; Western Metropolitan Electric Co., Ltd.; Wynmore Radio, Ltd.

Edmundsons Electricity Corporation, Ltd., has purchased the ordinary shares of the Wisbech Electric Light & Power Co., Ltd., from the B.E.T. Electricity Supply Co., Ltd. This transaction, being a transfer from one large group of electricity undertakings to another, follows the policy advocated in the McGowan Report. The Wisbech undertaking is adjacent to the areas of the East Anglian and the Bedfordshire, Cambridgeshire and Huntingdonshire companies, which are controlled by Edmundsons Electricity Corporation. Recently, furthering the same policy, Edmundsons sold the Ramsgate Co. to the County of London Co.

The Electrical Industries Trust's half-yearly report states that dividends were received from thirty-six of the forty-one companies in which investment is authorised. Increased dividends were declared by fifteen companies and, in addition, two distributed capital bonuses of 33⅓ per cent. and 20 per cent. respectively. These shares have been added to the trust fund. British Electric Traction and Crompton Parkinson paid the usual capital bonuses of 10 and 7 per cent. respectively, which have been sold and the proceeds included in the current distribution.

The Lightfoot Refrigeration Co., Ltd., records a net loss of £26,640 for 1936, against £28,294. Adding a debit of £35,181 brought in, a £61,821 deficit is carried forward. The board states that it has given serious consideration to the whole position of the company, and drastic reforms effected in the organisation will, it is anticipated, show considerable economies in future accounts.

The Cables Investment Trust, Ltd., reports an income for the year ended June 30th of £356,264, as compared with £273,572 for the preceding 11½ months. Expenses and debenture stock interest amounted to £126,915, leaving a profit of £229,349 (against £105,725), to which is added £8,102 brought in, making £237,451 available. The final ordinary dividend is 3 per cent., making 5 per cent. for the year (against 1½ per cent.), and £47,451 is carried forward.

The Electrical Distribution of Yorkshire, Ltd., is paying an interim dividend at the rate of 9 per cent. per annum on the ordinary stock.

The Yorkshire Electric Power Co. has declared an interim dividend at the rate of 6 per cent. per annum on the ordinary stock. The interim report states that the new generating plant at Thornhill station is in regular use and the Ferrybridge station extensions are being proceeded with. The sales of electricity continue to increase and further contracts with old and new consumers have been made.

W. T. Henley's Telegraph Works Co., Ltd., announces an interim dividend of 5 per cent. This compares with one of 7½ per cent. paid last year before the issue of the 100 per cent. share bonus in December.

The Consolidated Gas, Electric Light & Power Co. of Baltimore proposes to pay a quarterly dividend of 90 cents on its common shares.

The Northampton Electric Light and Power Co., Ltd., is to pay interim dividends of 2½ per cent. on its 5 per cent. preference shares and 4 per cent. on its ordinary shares.

The Rushden and District Electric Supply Co., Ltd., has declared an interim dividend of 3½ per cent. on its ordinary shares.

The City of Buenos Aires Tramways Co. (1904), Ltd., is to pay a quarterly dividend of 1¼ per cent. (same).

The Enfield Cable Works, Ltd., is maintaining its interim dividend at 10 per cent.

Stocks and Shares

TUESDAY EVENING.

AUGUST is not, as a rule, a month when the Stock Exchange expects to find activity in its markets, or public interest in stocks and shares. The month is yet young to venture upon any prediction in regard to whole of it, but, in spite of the August Bank Holiday, it may be said that markets have started off in a confident manner, suggesting that seasonal influences are not likely to be quite so prominent this month as they are in the ordinary way. The sustained strength of prices in the section for electrical manufacturing and equipment shares continues to be an outstanding feature. People are also buying the ordinary shares of the electricity supply companies, no doubt on the idea that these make sound, if somewhat humdrum industrial investments from which it is fairly safe to anticipate continuance of the dividends at present being paid and which allow a yield, as mentioned here last week, of 4 to 4½ per cent. on the money.

In the foreign group, Brazilian Tractions have made further progress in the upward direction. The new issues market, usually almost stagnant during August, attracts a good deal of attention at the moment, no doubt owing to the fact that people are developing a greater degree of courage in regard to the investment of their capital.

Seven Months' Survey

Following the customary practice at this week of the year, we set out a few tables of comparative prices, in order to show the net results of the year's working. It will be noticed that the purely investment stocks and shares are down on balance, this reflecting the general trend of quotations in British Government and other gilt-edged securities. The burden of the re-armament programme has pressed harshly upon the value of money, with the result that prices have given way. Correspondingly, of course, yields are higher than they were seven months ago. The original ill-fated N.D.C. proposals struck a blow from the effects of which Stock Exchange prices

have scarcely recovered. Moreover, the continuance of the war in Spain, with all its political implications and cross-currents, has proved something of a bear point for stocks and shares in the front rank.

Electricity Supply Shares

The proposals of the Government for amalgamating and co-ordinating the suppliers of electric power were of a nature so frankly Socialistic that they inevitably produced uneasiness in the minds of shareholders in the electricity companies. To what extent the proposals may be modified has yet to be made public. The financial effect can be seen from this representative comparison of share-prices :—

Share.	Dec. 31, 1936.	Now.	Fall.
City of London	56/6	33/–	3/6
Clyde Valley	45/6	39/–	6/6
County of London	53/6	49/6	4/–
Elec. Dis. Yorkshire	45/–	41/–	4/–
London Assoc. Electric	35/–	31/3	3/9
Metropolitan	50/6	46/–	4/6
Northampton	51/3	46/3	5/–
Scottish Power	41/–	37/–	4/–
Yorkshire Electric	44/6	39/–	5/6

It may be argued that the quotations given in the first column above, would have fallen whether there had been any Government plan or not, seeing that most investment values have declined during the period. The experience of the Stock Exchange market in the shares witnesses, however, to the fact that the shareholder in these companies was seriously disturbed. Recovery from the lowest prices was encouraged by the mature consideration that the plan is likely to be amended in various important details, and that at least twelve months may be expected to elapse before legislation reaches the Statute Book.

Manufacturing and Equipment

Changes in the share-prices of this group are of varied order. It is necessary to emphasise the fact that some of the companies have issued new shares at bonus prices, which necessarily prevents a correct rise or fall from being given. Due allowance must be made for this when conning the following figures. Broadly speaking, the market for shares in this section has been very popular with the investor. Substantial sums have gone into the shares of the leading companies. This table gives the net results without taking into account the value of the rights to which reference has just been made :—

Share.	Dec. 31, 1936.	Now.	Rise or Fall.
Aron Electricity Ord.	3	2½	−10/–
Assoc. Elec. Ord.	52/–	49/–	− 3/–
British Aluminium Ord.	44/–	53/6	+ 9/6
British Insulated Ord.	6½	5	−1½
Callender's	4⅜	4 13/16	+ 1/16
Crompton Parkinson Ord.	3⅜	2 7/16	− 15/16
Electric Construction	42/6	42/6	—
Enfield Cable Ord.	5 5/16	5 11/16	+ ⅜
English Electric	29/–	34/–	+ 5/–
G.E.C. Ord.	94/6	84/–	−10/6
Johnson & Phillips	49/6	47/–	− 2/6
Siemens Ord.	35/–	32/6	− 2/6
Telegraph Construction	33/9	52/6	+18/9

A Mixed Trio

The accompanying trio of prices shows a fairly heavy fall in the deferred stock of the British Electric Traction Company. The highest, 1625, ruled at the beginning of this year : the lowest has been 1220. Victoria Falls ordinary gave way as a reflection of a slump in Kaffir shares, from which a recent start has been made in the direction of recovery :—

Stock or Share.	Dec. 31, 1936.	Now.	Rise or Fall.
British Electric Traction Df. Ord.	1625	1275	−350
Brazil Traction	18½	27⅝	+9⅛
Victoria Falls Ord.	75/–	67/6	−7/6

Brazilian Tractions stand out as a feature of strength, on the idea that favourable results will spring from a reported agreement between Brazil and the United States on the matter of currency exchange. Mexico has furnished little else than disappointment this year to holders of Mexican utility issues. The Argentine Government's delay in reaching a settlement on the point of traffic negotiations in Buenos Aires is responsible for a setback in prices of stocks and shares of the companies concerned. Atlas shares have fallen heavily owing to the poor results of the Montevideo Tramways undertaking, in which Atlas holds a large stake.

Cable and Wireless

The re-organisation of Cable and Wireless capital is the principal event of the year so far as this group is concerned. The comparative prices make interesting reading :—

Stock or Share.	Dec. 31, 1936.	Now.	Rise or Fall.
American Tel. & Tel.	187½	171½	−16
Anglo-Am. Tel. Def.	31½	29½	−2
Cable & Wireless 5½% Pref.	101	107	+6
Globe Tel. & Tel. Ord.	14	16	+2
Great Northern Tel.	46½	42	−4½
Marconi-Marine	37/6	36/3	−1/3

Creation of new ordinary and new income stock in the Cable and Wireless combine has brought a useful volume of business to this market. Electric and Musical Industries shares, called "Emmies" for short, came into pronounced favour on the decision affecting television. American utilities, cable stocks amongst them, have swung to the tunes called by President Roosevelt and his one-time supporter Mr. John Lewis. The rubber market's share of business during the past seven months has been extremely meagre.

Share List of Electrical Companies

Home Electricity Companies.

	Nom.	Dividend. Previous.	Dividend. Last.	Price Aug. 3.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	67/6	—	4 9 0
City of London	1	7½	7½	33/–	—	4 11 0
Clyde Valley	1	7	8	39/–	—	4 2 1
County of London	1	10½	10½	49/6	+6d.	4 10 0
Edmundson's 7% Pref.	1	7	7	33/6	—	4 3 7
Do. Ord.	1	8	9	39/–	−1/–	4 12 4
Elec. Dis. Yorkshire	1	9	9	41/–	—	4 7 10
Elec. Fin. and Securities	1	12½	12½	2 11/16	—	4 13 0
Elec. Supply Corporation	1	11	12	52/–	—	4 12 8
Lancs Light and Power	1	7½	7½	34/–	—	4 8 3
Lond. Assoc. Electric	1	—	7	31/3	—	4 9 6
London Electric	1	7	8	35/6	—	4 10 2
London Power Deb. Red.	Stock	5	5	106½	—	4 14 0
Metropolitan	1	10	10	46/–	—	4 7 0
Midland Counties	1	7½	8	36/6	—	4 7 8
Mid. Elec. Power	1	8	9	2	—	4 10 0
North Eastern Electric Ordinary	1	6	7	32/6	—	4 6 2
Do. 7% Pref.	1	7	7	34/6	—	4 1 2
Northampton	1	10	10	46/3	+ 1/16	4 6 7
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	48/9	—	4 2 2
Do. do. 6% Pref.	1	6	6	30/6	—	3 18 8
Scottish Power	1	8	8	37/–	—	4 6 8
South London	1	7	7	32/–	—	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/–	—	6 10 4
Yorkshire Elec.	1	8	8	39/–	—	4 2 1

Public Boards.

Central Electricity, 1950–70	Stock	5	5	114	—	4 7 9
Do. 1955–75	,,	5	5	116	—	4 6 2
Do. 1951–73	,,	4½	4½	109	—	4 2 7
Do. 1963–93	,,	—	3½	97½	—	3 11 10
London Elec. Trans. Gtd.	,,	—	2½	86	−1½	2 18 1
London & Home Counties, 1955–75	,,	4½	4½	109	—	4 2 7
London Passenger Transport, A.	,,	—	4½	115½	—	3 18 3
Do. do. B.	,,	—	5	117½	—	4 5 1
Do. do. C.	,,	4	4	82	—	4 17 9
West Midlands Joint Elec. 1948–68	,,	—	5	111½	—	4 9 8

Telegraph and Telephone.

American Tel. & Tel.	$160	9	9	171½	—	5 5 0
Anglo-Am. Tel. Pref.	Stock	6	6	122	−1	4 18 4
Do. Def.	,,	1½	1½	29½	—	5 1 8
Cable & Wireless 5½% Pref.	,,	4⅛	5½	107	+1	5 2 9
Do. Ord.	,,	—	—	83½	+2	—
Do. Income	,,	—	—	101½	−½	3 18 10
Globe Tel. & Tel. Ord.	10	4½*	5½*	16	—	3 8 10
Do. do. Pref.	10	6	6	14½	—	4 5 9
Great Northern Tel.	10	20	20	42	+1	4 15 5
Marconi-Marine	1	10	7½	36/3	+ 1/16	4 2 9
Oriental Telephone Ord.	1	12*	12*	3½	—	3 16 10

Home and Foreign Trams, etc.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	5/–	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	19½	—	—
British Electric Traction Def. Ord.	,,	5	5	1275	+25	—
Do. do. Pref. Ord.	,,	8	8	168	+3	4 15 5
Brazil Traction	$100	40 cts.	50.cts.	27⅝	+1⅛	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	105½	—	4 14 9
Mexican Light Common	$100	Nil	Nil	2	—	—
Do. 1st Bonds	$500	5	5	44½	—	—
Victoria Falls Ord.	1	20	12	67/6	+⅛	3 11 2
West Riding	1	6½	10	43/9	—	4 11 4

Manufacturing Companies.

Aron Electricity Ord.	1	15	15	2½	—	6 0 0
Assoc. Elec. Ord.	1	8	10	49/–	+1/–	4 1 8
Do. Pref.	1	8	8	37/6	—	4 5 3
Babcock & Wilcox	1	8	10	48/3	+3d.	4 3 0
British Aluminium Ord.	1	7½	10	53/6	—	3 14 8
British Insulated Ord.	Stock	20	20	5	—	4 0 0
Brush Ord.	Stock	Nil	Nil	49½	—	—
Callender's	1	15	15	4 13/16	—	3 2 3
Do. 6½% Pref.	1	6½	6½	30/–	—	4 6 8
Crompton Parkinson Ord.	5/–	12½	12½	57/6	—	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	7	10	2½	+⅛	4 14 1
Enfield Cable Ord.	1	25	25	5 5/16	—	4 8 0
English Electric	1	Nil	Nil	34/–	+1/–	—
Do. do. Pref.	1	6½	6½	26/6	+6d.	4 18 1
Ericsson Tel.	5/–	20	25	2⅜	—	2 12 8
Ever Ready	5/–	35	45	33/6	—	6 12 6
Ferranti Pref.	1	7	7	27/6	—	5 1 10
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	15	17½	84/–	+2/–	4 3 4
Henley's	5/–	30	15	20/–	+9d.	3 15 0
Do. 4½% Pref.	1	4½	4½	1½	—	4 0 0
India-Rubber Pref.	1	5½	5½	22/6	—	4 17 9
Johnson & Phillips	1	7½	10	47/–	−6d.	4 5 1
Lancashire Dynamo	1	10	20	3⅜	—	5 18 4
Siemens Ord.	1	6	7½	32/6	—	4 12 4
Telegraph Construction	£1	Nil	7½	2⅜	—	2 17 2

* Dividends are paid free of Income Tax

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1935

3045. "Flame-operated switches for fire preventing or extinguishing equipment upon vehicles, craft and the like." Graviner Manufacturing Co., Ltd., and H. M. Salmond. January 29th, 1936. (468426.)

11482. "Electric motor starters employing starting resistances." Brookhirst Switchgear, Ltd., and F. Heaton. April 14th, 1936. (468558.)

28360. "Remote-control systems using currents superposed on energy-distributon networks." Naamlooze Vennootschap Tot Kuering Van Electro-Technische Materialen. October 15th, 1934. (468561.)

29713. "Electric supply systems." J. L. P. G. Martin. April 4th, 1935. (468431.)

30989. "Electron multipliers." J. E. Keyston. November 8th, 1935. (468623.)

33357. "System for lighting roads, aerodromes, wharves, and similar surfaces." Safe-Beam Lamp, Ltd., and W. H. Lund. December 2nd, 1935. (468436.)

33497. "Television receiver." Radioakt.-Ges. D. S. Loewe. December 4th, 1934. (468437.)

33528. "Electrostatic sound receivers and reproducers." J. Massolle Ges., and J. Massolle. December 3rd, 1934. (468624.)

33669?. "Electrical recording apparatus for weighing machines." E. & T. Fairbanks & Co., and H. A. Hadley. December 5th, 1935. (468440.)

33749. "Mercurial electrical cut-outs." P. E. Davy. December 5th, 1935. (468441.)

1936

97. "Lighting and advertising devices using neon or other gaseous tubes, also light tubes carrying filaments." G. A. Brockhurst. January 2nd, 1936. (468563.)

393. "Electric-discharge apparatus." W. Lehmann. January 4th, 1935. (468630.)

418. "Photo-electric methods of automatically examining surfaces." H. J. Gregory and W. G. Radley. January 6th, 1936. (468448.)

439. "Television transmission method." Radioakt.-Ges. D. S. Loewe. January 9th, 1935. (468505.)

451. "Manufacture of double or multiple helical tungsten incandescent bodies." Egyesult Izzolampa Es Villamossagi Reszvenytarsasag. January 7th, 1935. (468449.)

453. "Automatic or semi-automatic telephone systems." Standard Telephones & Cables, Ltd., E. P. G. Wright and L. P. Lowry. January 6th, 1936. (468632.)

572. "Vitreous compositions suitable for envelopes of electric-discharge lamps." British Thomson-Houston Co., Ltd., and D. Gabor. January 7th, 1936. (468568.)

702. "Portable wireless-signalling apparatus." J. Pintsch Akt.-Ges. January 8th, 1935. (468635.)

704. "Draw-out electric switchgear." British Thomson-Houston Co., Ltd., E. D. Regis and H. E. Cox. January 8th, 1936. (468636.)

709. "Modulated carrier-wave transmitters." Marconi's Wireless Telegraph Co., Ltd., and E. Green. January 8th, 1936. (468756.)

717. "Fluxes and flux-coated electrodes for electric welding." A. M. Roberts and Metropolitan-Vickers Electrical Co., Ltd. January 8th, 1936. (468703.)

719. "Fluxes and flux-coated electrodes for electric welding." M. R. Moritz and Metropolitan-Vickers Electrical Co., Ltd. January 8th, 1936. (468455.)

768. "Electric resistance heating elements." R. H. Rogers. January 9th, 1936. (468758.)

881. "Interference-eliminating apparatus for radio receivers." Galvin Manufacturing Corporation. January 10th, 1935. (468763.)

882. "Interference eliminating apparatus for radio receivers." Galvin Manufacturing Corporation. November 18th, 1935. (468458.)

1244. "Electrically heated steam generators or water heaters." Boucher-Giles & Co., Ltd., and J. M. Hollis. January 15th, 1936. (468512.)

1356. "Automatically controlled electric lighting for cupboards and the like." Burndept, Ltd., and H. H. V. Stanley. January 15th, 1936. (468712.)

1451. "Rail-contact arrangements." Vereinigte Eisenbahn-Signal-Werke Ges. November 23rd, 1935. (Addition to 360768.) (468570.)

2045. "Extra-high-pressure metal vapour electric discharge devices." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Gluhlampen.) January 22nd, 1936. (469643.)

2640. "Switches for portable electric power tools." C. Oliver. J. R. Thorpe and Oliver Pell Control, Ltd. January 29th, 1936. (468645.)

3508. "Braking systems." British Thomson-Houston Co., Ltd., R. D. Given, T. H. Petch, jun., and J. W. Crofts. February 5th, 1936. (468713.)

4633. "Vacuum-tight joints for electrodes penetrating through the bottom o fionic valve metal vessels." Allmanna Svenska Elektriska Aktiebolaget. February 27th, 1935. (468522.)

6323. "Control apparatus for battery-operated vehicles." G. H. Millar, W. T. Gray and Metropolitan-Vickers Electrical Co., Ltd. March 2nd, 1936. (468720.)

6380. "Method of manufacturing 'T,' elbow, and like inspection fittings for electrical conduits." E. J. Trawford. March 3rd, 1936. (468649.)

7884. "Telephone systems." Siemens Bros. & Co., Ltd., B. A. Hensler, and H. E. Humphries. March 16th, 1936. (Addition to 412302.) (468722.)

10261. "Carriers for cartridge fuses." British Insulated Cables, Ltd., and R. W. Blades. April 17th, 1936. (468530.)

10604. "Method of applying luminescent substances to the surface of a vitreous body." British Thomson-Houston Co., Ltd., and General Electric Co., Ltd. April 11th, 1935. (468531.)

10836. "Electric distribution pillars, sub-station panels, and like arrangements." W. T. Henley's Telegraph Works Co., Ltd., and A. T. Crowe. April 15th, 1936. (468532.)

12461. "Common-wave radio-transmitter system." R. J. Berry (C. Lorenz Akt.-Ges.). May 1st, 1936. (468724.)

15645. "Electric resistance having a negative temperature coefficient and method of manufacturing such resistances." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 17th, 1935. (468477.)

21448. "Television or like electrical image transmitting systems." Standard Telephones & Cables, Ltd. August 3rd, 1935. (468483.)

22233. "Electrically driven vehicle jacks." Elwa-Electro Akt.-Ges. September 16th, 1935. (468540.)

23550. "Methods of coating the interior of electric-discharge tubes with luminescent substances." Franco-British Electrical Co., Ltd., and A. H. Brackensey. August 27th, 1936. (468543.)

25247. "Electrolytic water-decomposing apparatus with concentrically arranged electrodes." Siemens & Halske Akt.-Ges. September 30th, 1935. (468589.)

26068. "High-frequency signalling systems or apparatus." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). September 25th, 1936. (Convention date not granted.) (468548.)

26287. "Control of alternating-current circuits by saturable chokes." J. Pintsch Akt.-Ges. April 9th, 1936. (Addition to 467628.) (468550.)

28203. "Magnetron tubes and circuit arrangements incorporating the same." Telefunken Ges für Drahtlose Telegraphie. October 16th, 1935. (468596)

29177. "Apparatus and method for remedying crosstalk." Standard Telephones & Cables, Ltd. November 9th, 1935. (468735.)

29183. "Electrode systems with unsymmetrical conductivity." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 30th, 1935. (468736.)

29323. "Electric transformers." British Thomson-Houston Co., Ltd. October 29th, 1935. (468601.)

29793. "Teleprinting and like systems." Siemens and Halske Akt.-Ges. November 1st, 1935. (468493).

30639. "Electron-discharge apparatus." G. Weiss. January 8th, 1935. (Divided out of 633/36.) (Cognate applications 30640/36 and 30641/36.) (468665.)

30686. "Thermal electrical cut-outs and appliances embodying such cut-outs" F. W. Piddock and W. Lorch. November 10th, 1936. (468494.)

30710. "Automatic electric switches, particularly for street petrol stations." F. Hejduk and J. Neumann. November 10th, 1936. (468603.)

31873. "Positive electrode for galvanic cells." Carbo-Norit-Union Verwaltungs-Ges. January 31st, 1936. (Cognate application 31874/36.) (468496.)

33605. "Coating device for use in the manufacture of dollies for electric cells." Economic Distributors, Ltd. (Autom Spezial-Maschinen Ges.). December 7th, 1936. (468498.)

34243. "Single-phase transformers." J. Morelisse. January 25th, 1936. (468607.)

35250. "Electric accumulators." Chloride Electrical Storage Co., Ltd. December 24th, 1935. (468612.)

1937

5081. "Commutator for electric motors." L. N. Reddie (K. Silberstein). February 19th, 1937. (468616.)

5860. "Electric gas-blast switches." British Thomson-Houston Co., Ltd. February 28th, 1936. (468617.)

11540. "Coupling means for permeability-tuned circuits for wireless reception." Johnson Laboratories, Inc. June 26th, 1935 (Divided out of 34919/35.) (468675.)

11563. "Compensator for sound direction-finding apparatus." Electroacustic Ges. May 2nd, 1936. (468748.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 28th.

Prestcold, P.S.C. (lettering and design). No. 571371. Class 6. Refrigerating machines and parts thereof.—The Pressed Steel Co., Ltd., Cowley, Oxford.

Cinaudagraph. No. 572342. Class 8. Sound-reproducing and recording apparatus and parts thereof.—Cinaudagraph Corporation, Stamford, Conn., U.S.A. (British representatives: Abel & Imray, 30, Southampton Buildings, Chancery Lane, W.C.2).

Tubalox. No. 576097. Class 13. Electric immersion heaters of ordinary metal.—George Bray & Co., Ltd., Bagby Works, Leicester Place, Leeds.

Ali-Tal. No. 577014. Class 13. Reflectors, shades, shade holders, electric lampholders, floor and table lamp standards, wall brackets, &c., all being metal goods. No. 577014/5. Class 14. Ditto of aluminium or in which aluminium predominates. No. 577016. Class 15. Glass lampshades, globes and reflectors. —The Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, N.17.

Exalt. No. 577263. Class 13. Electric switches (ordinary), electric bell pushes and combined electric switches and plug contacts.—The General Accessories Co., Ltd., 18-22, Euston Buildings, George Street, N.W.1.

Torribar. No. 577631. Class 13. Sheathed electric heating elements, wholly or mainly of ordinary metal.—The Hotpoint Electric Appliance Co., Ltd., 24, Newman Street, W.1.

Duromould. No. 576152. Class 17. Plastic moulding compositions mainly of cement. No. 576153. Class 50. Ditto mainly of asbestos or cane pulp.—Radio Gram and Television, Ltd., Aeolian House, 135-137, New Bond Street, W.1.

Vinifol (lettering and design). No. 576153. Class 50. Synthetic resin sold in the form of sheets for electrical insulating purposes.—I. G. Farbenindustrie Gesellschaft, Frankfurt-am-Main, Germany. (British representatives: Abel & Imray, address as above.)

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Nurses' home at Woodend Hospital (£60,000); G. Hall, Back Hilton Road.

Adwick-le-Street (DONCASTER).—Council offices; U.D.C. surveyor.

Anglesey.—Extensions and alterations to Holyhead County school, including class rooms, dining hall, kitchen, storerooms, &c., for E.C.; architect's department, Glanaber, Llangefni.

Aston.—Additions to factory, Moore Bros. (Birmingham), Ltd., Priory Road; Maddocks & Walford, builders, Tyburn Road, Erdington.

Bethesda.—Houses (33); I. Williams, architect, Brynderwen Offices, Penmaenmawr.

Birkenhead.—Houses (186), Woodchurch estate; borough engineer. School; St. Joseph's R.C. trustees.

Birmingham.—Schools, Paganel Road, Stonehouse estate; P. W. Cox, Ltd., builders, Grove Lane. Reconstruction of Grand Theatre, Corporation Street, for A. B. Fairley, Locarna Dance Hall, Sauchiehall Street, Glasgow; G. E. Pepper, architect, 116, Colmore Row.

Bishop Auckland.—Stores for Victors Stores, Ltd., 83, High Street, Putney, London, S.W.15.

Blackpool.—Cinema, Dickson Road, for the Odeon Theatres, Ltd.

Bury.—Technical college (£81,260), for E.C.

Chelmsford.—Extensions to works, New Street; Marconi's Wireless Telegraph Co.

Chester.—Schools, Lache and Blacon estates; city engineer.

Chesterton.—Houses, Dry Drayton, Elsworth, Girton, Harlton, Landbeach, Over, and Stapleford; J. R. Oxenham, architect, County Hall, Hobson Street, Cambridge.

Colne (LANCASHIRE).—Houses, Temple Street and Intake Farm estates (£17,452); borough surveyor.

Coventry.—Block of shops and flats at the corner of Trinity Street and Hales Street; C. Redgrave & Son, architects, Earl Street. Cinema, Tile Hill Lane; E. Harris & Son, builders, Cope Street. Factory for Briggs Motor Bodies, Ltd., Dagenham.

Crawcrook (Co. DURHAM).—Block of offices and shops, for Pattinson and Son; J. W. Taylor and Sons, architects, Union Buildings, St. John Street, Newcastle-on-Tyne.

Croydon.—Factory, Purley Way, Waddon, for the Waddon Concrete Co.

Daventry.—Factory for Brook Manufacturing Co., Clarke Road, Northampton.

Derby.—Cinema, East Street, for the Associated Cinema Properties, Ltd.

Derbyshire.—School, Bolsover (£14,780), for County E.C. School, Newhall, for C.C., County Offices, St. Mary's Gate, Derby.

Desborough (NORTHAMPTONSHIRE).—Cinema; C. E. Wilford, architect, Leicester.

Devonport.—Flats (60), Prospect Row (£33,270), and Cornwall Road (£33,670); Pearn Bros., Ltd.

Dorset.—County buildings, including offices, council chamber, court and county library (£149,500), for C.C.; County Offices, Dorchester.

Dursley (GLOUCESTERSHIRE).—Houses (36), Draycott site; clerk, R.D.C. Offices, Kingshill.

East Ashford (KENT).—Houses (50), scheme No. 5 (£20,251); H. L. Meadows, clerk of works, Willesborough.

Enfield.—Houses, near Baker Street; Wates, Ltd., 1258, London Road, S.W.16.

Erdington.—Rebuilding the Queen's Head Hotel (£30,000), Six Ways; William Jackson, Ltd., builders, Langley Road, Birmingham.

Frome.—Houses, Coleford, Beckington, Mells, Norton St. Philip and Buckland Dinham; R.D.C. surveyor.

Friern Barnet.—Municipal offices (£44,500); U.D.C. surveyor, Council Offices, London, N.11.

Gravesend.—School, Northcourt estate, for E.C.; borough architect, 5, Woodville Terrace.

Hazel Grove.—Cinema, Macclesfield Road, for the Marcliffe Cinema (Knutsford), Ltd.

Hebburn-on-Tyne.—Cinema, Victoria Road West, for Dawe Bros., Gibb Chambers, Westgate Road, Newcastle-on-Tyne; P. L. Browne, Son and Harding, Pearl Buildings, Northumberland Street, Newcastle-on-Tyne.

High Hesleden (Co. DURHAM).—Houses (38); G. Hudson, builder, Sunderland Road, Horden.

Horden.—Cinema; W. L. Grant, builder, Loaning Burn, Easington Village.

Ilkeston.—Factory, Awsworth Road; A. Booth & Sons. Stores, Bath Street; F. W. Woolworth & Co., Ltd., 1, New Bond Street, London, W.1.

Isleworth.—School, Ridgway Road (£46,980); Stewart & Co.

Kidderminster.—School, Habberley Road (£73,730), for E.C.

Kilmarnock.—Houses, between High Street and Boyd Street (£14,430); burgh surveyor.

Kingston-on-Thames.—Houses (38), Kingston estate; borough surveyor, Guildhall, Kingston-on-Thames.

Lancashire.—School, Colne, for C.C.; S. Wilkinson, County Offices, Preston.

Lancaster.—Bus station (£13,950); borough engineer.

Liverpool.—Flats (108), St. Oswald Street, Old Swan (£52,380); Unit Construction Co., Ltd., builders, 1, Robert Street, London, W.C.2.

London.—(DEPTFORD).—Dwellings (195), Addey Street, for L.C.C. (£108,500); L.C.C. architect, County Hall, Westminster, S.E.1.

Meir (STAFFORDSHIRE).—Houses (48), Ceverswall Road; A. Glyn Sherwin, architect.

Middlesex.—Extensions to hospital, Edgware (£45,000), and reconstruction of North Middlesex Hospital (£2,000,000); county architect, 10, Great George Street, S.W.1.

Murton (Co. DURHAM).—Houses (244), for the North-Eastern Housing Association; W. and T. R. Milburn, architects, 17, Fawcett Street, Sunderland. Hotel for Robinson Bros., Houghton-le-Spring; G. E. Matkin, architect, Fawcett Street, Sunderland.

Nantwich.—Houses (40), Wall Fields sites; U.D.C. surveyor, Council Offices, 28, Barker Street.

Northolt.—Houses (178), Stanley Avenue, &c.; J. M. Wilson, architect, Station Chambers, Hayes. Houses (28), Castle Road; Swannell & Sly, architects, Rickmansworth.

North Shields.—Shops and houses, Ridges estate; Hastie D. Burton, Ltd., builders, King Street.

Nuneaton.—School, Arbury Road (£40,000), with electrical work; W. H. Jones & Son, builders, Lockhurst Lane, Coventry.

Oldbury.—Houses (30), Bleakhouse estate; borough engineer.

Oldham.—Houses, Huddersfield Road, Waterhead and Dove Cote Lane, Springhead; Dyson & Barlow, builders, 2, Springs Road, Chadderton.

Plymouth.—Houses (106) and flats, Peters Park estate (£51,634); Building & Public Works Construction Co., Ltd. Reconstruction of hospital (£225,000); city architect.

Port Glasgow.—Cinema; A. B. King Circuit, 167, Bath Street, Glasgow.

Reading.—Fire station buildings, Caversham Road; A. S. Parsons, surveyor, Town Hall.

Redhill.—Cinema, for the Odeon (Redhill), Ltd.

Rothwell (YORKSHIRE).—Houses (40), Oulton estate; U.D.C. surveyor.

Rugby.—Town Hall and Municipal Buildings, The Lawns (£90,478), with electrical work; borough surveyor.

Salford.—Houses, Littleton Road and Moor Lane, Kersal; Cassel & Sons, Ltd., 300, Great Cheetham Street, Higher Broughton, Manchester.

Shrewsbury.—Houses (86); Towers, Wilson & Co., builders, Tettenhall, Staffordshire.

Slough.—Store premises, 152-154, High Street, for the British Home Stores, Ltd., Abbey House, Baker Street, London, N.W.1.

Southsea.—Large block of flats, Craneswater estate; A. Roberts & Co., Ltd., builders, 74, Earls Court Road, London, W.8.

South Shields.—Houses (220-acre site), at the south end of the town; borough engineer.

Spalding.—Houses (22), Crowland; T. Measures, builder, Peterborough.

Stone (STAFFORDSHIRE).—Houses (36), Red Hill site; G. S. Challacombe, U.D.C. surveyor, Town Hall.

Stourbridge.—Extensions to Council offices (£11,600); borough engineer.

Surbiton.—Shops and flats, St. Mark's Hill; J. N. Coleman, architect, 12, the Broadway, Stoneleigh, Ewell.

Surrey.—School, Green Wrythe Lane, Carshalton (£16,688), for County E.C.; Burnand & Pickett, builders, Wallington.

Sussex.—School, Cuckfield (£28,950); East Sussex county architect, Lewes.

Sutton Coldfield.—Houses (20), Halton Road; Alton Estates, Ltd. Houses (78), near King's Road; W. H. Heeley. Factory, Kingsbury Road; Light Alloy Co.

Swadlincote.—Houses (64), Stanton; S. Whitaker, builder, Common Road, Church Gresley.

Thurlstone (HUDDERSFIELD).—Houses (24), Royd Lane; U.D.C. surveyor.

Tunbridge Wells.—Police station, police court, and assembly hall (£86,480); R. Corben & Sons, Ltd., builders, Maidstone.

Tynemouth.—Y.M.C.A. centre (£36,500); S. Miller, Ltd., builders, 17, North Street, Newcastle-on-Tyne.

Wallasey.—School, Eastway, Moreton; Quiggin & Gee, architects, North John Street, Liverpool, 2.

Walsall.—Houses (81), section 5, Harden North site (£22,626); L. G. Peace, builder, Walsall. Houses (77), section 4 (£24,825); Sabin & Young, Ltd., builders, Rushall.

Walthamstow.—Shops and showrooms, High Street; W. Braxton-Sinclair, architect, Craig's Court, London, S.W.1.

Watford.—Houses (44), Riverside Road; borough surveyor, 14, High Street.

Wembley.—Flats, shops and offices, for Raglan Property Trust, Ltd.; Raglan Building Co., Ltd., King's Court.

West Bromwich.—Development of Tanhouse Farm (27 acres); A. H. Brain. Extensions to works, Great Bridge; Wellington Tube Works, Ltd.

Westmorland.—School buildings, adjacent to existing school, Kent Terrace, Kendal, for E.C.; J. E. Mason, director of education, Lowther House, Kendal.

Whickham-on-Tyne.—Houses, Dunston, Marley Hill, Swalwell and Whickham; U.D.C. surveyor.

Wigan.—Houses (220), Worsley Hall site (£73,350); borough surveyor.

York.—Houses, Broadway; T. Gledhill.

Busy Year for the Post Office

Details of the work of the Post Office were given by Major Tryon, the Postmaster-General, in the House of Commons last week. He showed that cheaper telephones and the allowance of free calls had produced a notable increase in installations last year, namely, 248,000, and within the last six months the increase was 147,000. They were spending in the present year £17,750,000 on telephone development, which was unprecedented—two and a half times as much as in 1934. In the last two years they had added 11,000 people to the engineering staff, while the telephone supervisors had been increased by 250.